



### 150W Single Output Switching Power Supply

## NES-150 series



#### ■ Features :

- AC input range selectable by switch
- Protections: Short circuit / Overload / Over voltage
- Cooling by free air convection
- LED indicator for power on
- 100% full load burn-in test
- High efficiency, long life and high reliability
- 2 years warranty



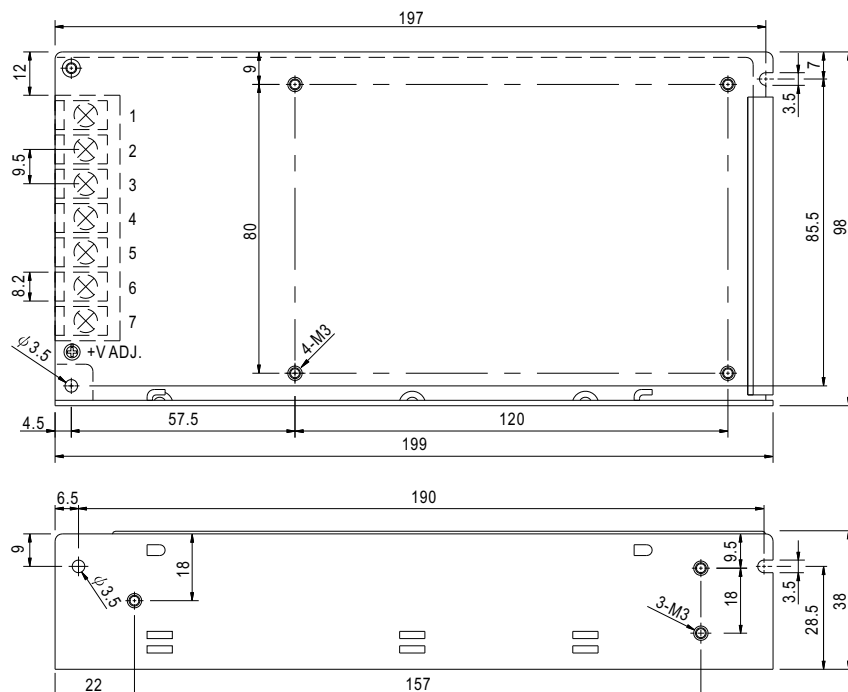
#### SPECIFICATION

| MODEL                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | NES-150-3.3                                                                                                                                                                                                            | NES-150-5   | NES-150-7.5 | NES-150-9   | NES-150-12   | NES-150-15    | NES-150-24   | NES-150-48   |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------|-------------|--------------|---------------|--------------|--------------|
| OUTPUT                   | DC VOLTAGE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 3.3V                                                                                                                                                                                                                   | 5V          | 7.5V        | 9V          | 12V          | 15V           | 24V          | 48V          |
|                          | RATED CURRENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 30A                                                                                                                                                                                                                    | 26A         | 20A         | 16.7A       | 12.5A        | 10A           | 6.5A         | 3.3A         |
|                          | CURRENT RANGE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 0 ~ 30A                                                                                                                                                                                                                | 0 ~ 26A     | 0 ~ 20A     | 0 ~ 16.7A   | 0 ~ 12.5A    | 0 ~ 10A       | 0 ~ 6.5A     | 0 ~ 3.3A     |
|                          | RATED POWER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 99W                                                                                                                                                                                                                    | 130W        | 150W        | 150W        | 150W         | 150W          | 156W         | 158.4W       |
|                          | RIPPLE & NOISE (max.) <small>Note.2</small>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 80mVp-p                                                                                                                                                                                                                | 80mVp-p     | 120mVp-p    | 120mVp-p    | 120mVp-p     | 120mVp-p      | 120mVp-p     | 200mVp-p     |
|                          | VOLTAGE ADJ. RANGE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 3.2 ~ 3.5V                                                                                                                                                                                                             | 4.75 ~ 5.5V | 7.13 ~ 8.3V | 8.55 ~ 9.9V | 11.4 ~ 13.5V | 14.25 ~ 16.5V | 22.8 ~ 27.6V | 45.6 ~ 52.8V |
|                          | VOLTAGE TOLERANCE <small>Note.3</small>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ±3.0%                                                                                                                                                                                                                  | ±2.0%       | ±1.0%       | ±1.0%       | ±1.0%        | ±1.0%         | ±1.0%        | ±1.0%        |
|                          | LINE REGULATION <small>Note.4</small>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | ±0.5%                                                                                                                                                                                                                  | ±0.5%       | ±0.5%       | ±0.5%       | ±0.5%        | ±0.5%         | ±0.5%        | ±0.5%        |
|                          | LOAD REGULATION <small>Note.5</small>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | ±2.0%                                                                                                                                                                                                                  | ±1.0%       | ±0.5%       | ±0.5%       | ±0.5%        | ±0.5%         | ±0.5%        | ±0.5%        |
|                          | SETUP, RISE TIME <small>Note.7</small>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 800ms, 20ms/230VAC      1200ms, 30ms/115VAC at full load                                                                                                                                                               |             |             |             |              |               |              |              |
| HOLD UP TIME (Typ.)      | 24ms/230VAC      20ms/115VAC at full load                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                        |             |             |             |              |               |              |              |
| INPUT                    | VOLTAGE RANGE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 90 ~ 132VAC / 180 ~ 264VAC selected by switch      254 ~ 373VDC                                                                                                                                                        |             |             |             |              |               |              |              |
|                          | FREQUENCY RANGE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 47 ~ 63Hz                                                                                                                                                                                                              |             |             |             |              |               |              |              |
|                          | EFFICIENCY (Typ.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 73%                                                                                                                                                                                                                    | 78%         | 80%         | 83%         | 83%          | 83%           | 86%          | 86%          |
|                          | AC CURRENT (Typ.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 3A/115VAC      2A/230VAC                                                                                                                                                                                               |             |             |             |              |               |              |              |
|                          | INRUSH CURRENT (Typ.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | COLD START 45A/230VAC                                                                                                                                                                                                  |             |             |             |              |               |              |              |
|                          | LEAKAGE CURRENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <2mA / 240VAC                                                                                                                                                                                                          |             |             |             |              |               |              |              |
| PROTECTION               | OVERLOAD                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 110 ~ 150% rated output power<br>Protection type : Hiccup mode, recovers automatically after fault condition is removed                                                                                                |             |             |             |              |               |              |              |
|                          | OVER VOLTAGE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 3.8 ~ 4.65V    5.75 ~ 6.75V    8.6 ~ 10.1V    10.4 ~ 12.2V    13.8 ~ 16.2V    17.25 ~ 20.25V    27.6 ~ 32.4V    55.2 ~ 62.4V<br>Protection type : Hiccup mode, recovers automatically after fault condition is removed |             |             |             |              |               |              |              |
|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                        |             |             |             |              |               |              |              |
| ENVIRONMENT              | WORKING TEMP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | -20 ~ +60℃ (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<br>(Note 6) | SAFETY STANDARDS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | UL60950-1, TUV EN60950-1 Approved                                                                                                                                                                                      |             |             |             |              |               |              |              |
|                          | WITHSTAND VOLTAGE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | I/P-O/P:3KVAC    I/P-FG:1.5KVAC    O/P-FG:0.5KVAC                                                                                                                                                                      |             |             |             |              |               |              |              |
|                          | ISOLATION RESISTANCE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | I/P-O/P, I/P-FG, O/P-FG:100M Ohms/500VDC 70% RH                                                                                                                                                                        |             |             |             |              |               |              |              |
|                          | EMI CONDUCTION & RADIATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Compliance to 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, EN61000-6-1, heavy industry level, criteria A                                                                                                         |             |             |             |              |               |              |              |
| OTHERS                   | MTBF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 433.3Khrs min.    MIL-HDBK-217F (25℃)                                                                                                                                                                                  |             |             |             |              |               |              |              |
|                          | DIMENSION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 199*98*38mm (L*W*H)                                                                                                                                                                                                    |             |             |             |              |               |              |              |
|                          | PACKING                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 0.7Kg; 30pcs/22Kg/1.24CUFT                                                                                                                                                                                             |             |             |             |              |               |              |              |
| NOTE                     | 1. All parameters NOT specially mentioned are measured at 230VAC input, rated load and 25℃ of ambient temperature.<br>2. Ripple & noise are measured at 20MHz of bandwidth by using a 12" twisted pair-wire terminated with a 0.1uf & 47uf parallel capacitor.<br>3. Tolerance : includes set up tolerance, line regulation and load regulation.<br>4. Line regulation is measured from low line to high line at rated load.<br>5. Load regulation is measured from 0% to 100% rated load.<br>6. 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.<br>7. Length of set up time is measured at cold first start. Turning ON/OFF the power supply very quickly may lead to increase of the set up time. |                                                                                                                                                                                                                        |             |             |             |              |               |              |              |

## 150W Single Output Switching Power Supply

## ■ Mechanical Specification

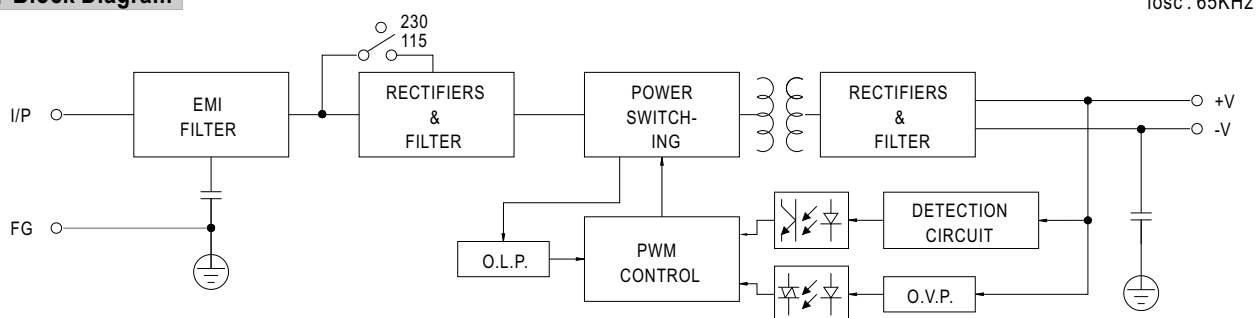
Case No. 902    Unit:mm



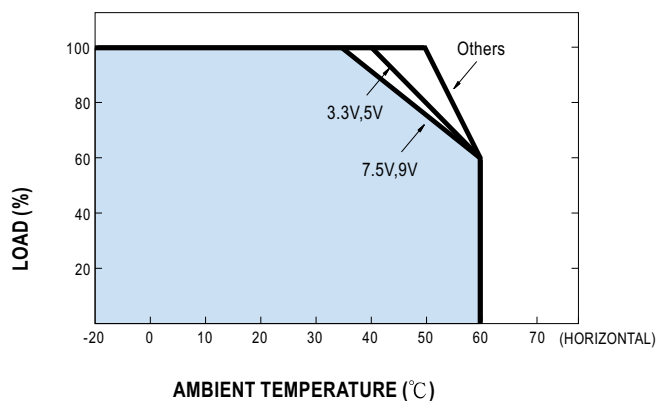
### Terminal Pin No. Assignment

| Pin No. | Assignment       | Pin No. | Assignment   |
|---------|------------------|---------|--------------|
| 1       | AC/L             | 4,5     | DC OUTPUT -V |
| 2       | AC/N             | 6,7     | DC OUTPUT +V |
| 3       | EG $\frac{1}{2}$ |         |              |

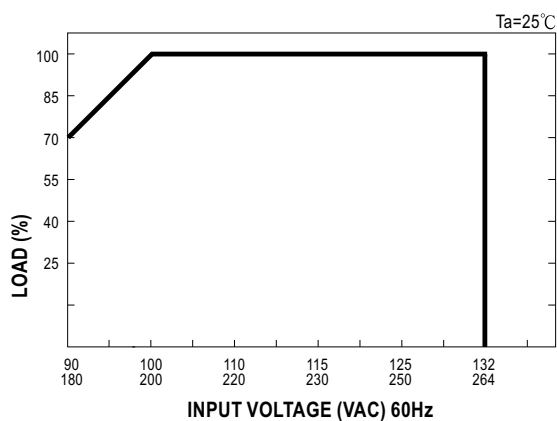
### ■ Block Diagram



### Derating Curve



## ■ Static Characteristics



**MODEL : NES-150-24**
**OUTPUT FUNCTION TEST**

| NO | TEST ITEM                      | SPECIFICATION                                 | TEST CONDITION                                                | RESULT                                             | VERDICT |
|----|--------------------------------|-----------------------------------------------|---------------------------------------------------------------|----------------------------------------------------|---------|
| 1  | RIPPLE & NOISE                 | V1: 120 mVp-p (Max)                           | I/P: 230 VAC<br>O/P:FULL LOAD<br>Ta:25°C                      | V1: 28 mVp-p (Max)                                 | P       |
| 2  | OUTPUT VOLTAGE<br>ADJUST RANGE | CH1: 22.8 V~ 27.6 V                           | I/P: 230 VAC<br>I/P: 115 VAC<br>O/P:MIN LOAD<br>Ta:25°C       | 29.54V~ 22.12 V/ 230VAC<br>29.55V~ 22.12 V/ 115VAC | P       |
| 3  | OUTPUT VOLTAGE<br>TOLERANCE    | V1: -1 %~ 1 % (Max)                           | I/P: 200 VAC / 264 VAC<br>O/P:FULL/ 0 % LOAD<br>Ta:25°C       | V1:-0.03 %~ 0.07 %                                 | P       |
| 4  | LINE REGULATION                | V1:-0.5 %~ 0.5 % (Max)                        | I/P: 200 VAC ~ 264 VAC<br>O/P:FULL LOAD<br>Ta:25°C            | V1: 0 %~ 0 %                                       | P       |
| 5  | LOAD REGULATION                | V1: -0.5 %~ 0.5 % (Max)                       | I/P:230 VAC<br>O/P:FULL ~MIN LOAD<br>Ta:25°C                  | V1: -0.02 %~ 0.02 %                                | P       |
| 6  | SET UP TIME                    | 230 VAC/800 ms (Max)<br>115 VAC/1200 ms (Max) | I/P:230 VAC<br>I/P:115 VAC<br>O/P:FULL LOAD<br>Ta:25°C        | 230VAC/ 343.051 ms<br>115VAC/ 350.218 ms           | P       |
| 7  | RISE TIME                      | 230 VAC/20 ms (Max)<br>115 VAC/30 ms (Max)    | I/P:230 VAC<br>I/P:115 VAC<br>O/P:FULL LOAD<br>Ta:25°C        | 230VAC/ 4.948 ms<br>115VAC/ 4.949 ms               | P       |
| 8  | HOLD UP TIME                   | 230 VAC/ 24 ms(TYP)<br>115 VAC/ 20 ms(TYP)    | I/P: 230 VAC<br>I/P: 115 VAC<br>O/P:FULL LOAD<br>Ta:25°C      | 230VAC/ 25.194 ms<br>115VAC/ 21.956 ms             | P       |
| 9  | OVER/UNDERSHOOT TEST           | < ±5%                                         | I/P: 230 VAC<br>O/P:FULL LOAD<br>Ta:25°C                      | TEST: 0.42 %                                       | P       |
| 10 | DYNAMIC LOAD                   | V1: 2400 mVp-p                                | I/P: 230 VAC<br>O/P:FULL /Min LOAD<br>90%DUTY/1KHZ<br>Ta:25°C | 672 mVp-p                                          | P       |

**INPUT FUNCTION TEST**

| NO | TEST ITEM             | SPECIFICATION                        | TEST CONDITION                                                                                                                             | RESULT                                       | VERDCT |
|----|-----------------------|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|--------|
| 1  | INPUT VOLTAGE RANGE   | 180VAC~ 264 VAC                      | I/P:TESTING<br>O/P:FULL LOAD<br>Ta:25°C                                                                                                    | 150.062 V~ 264 V                             | P      |
|    |                       |                                      | I/P:<br>LOW-LINE-3V= 177 V<br>HIGH-LINE+15%= 300 V<br>O/P:FULL/MIN LOAD<br>ON: 30 Sec . OFF: 30 Sec 10MIN<br>( AC POWER ON/OFF NO DAMAGE ) | TEST: OK                                     |        |
| 2  | INPUT FREQUENCY RANGE | 47 HZ ~ 63 HZ<br>NO DAMAGE OSC       | I/P: 200 VAC ~ 264 VAC<br>O/P:FULL-MIN LOAD<br>Ta:25°C                                                                                     | TEST: OK                                     | P      |
| 3  | EFFICIENCY            | 86 % (TYP)                           | I/P: 230 VAC<br>O/P:FULL LOAD<br>Ta:25°C                                                                                                   | 86.07 %                                      | P      |
| 4  | INPUT CURRENT         | 230 V/ 2 A (TYP)<br>115 V/ 3 A (TYP) | I/P: 230 VAC<br>I/P: 115 VAC<br>O/P:FULL LOAD<br>Ta:25°C                                                                                   | I = 1.5097 A/ 230 VAC<br>I = 2.423A/ 115 VAC | P      |
| 5  | INRUSH CURRENT        | 230 V/ 45 A(TYP)<br>COLD START       | I/P:230 VAC<br>O/P:FULL LOAD<br>Ta:25°C                                                                                                    | I = 39.617 A/ 230 VAC                        | P      |
| 6  | LEAKAGE CURRENT       | < 2 mA / 240 VAC                     | I/P:264 VAC<br>O/P:Min LOAD<br>Ta:25°C                                                                                                     | L-FG: 1.35 mA<br>N-FG: 1.05 mA               | P      |



## PROTECTION FUNCTION TEST

| NO | TEST ITEM               | SPECIFICATION                          | TEST CONDITION                           | RESULT                          | VERDICT |
|----|-------------------------|----------------------------------------|------------------------------------------|---------------------------------|---------|
| 1  | OVER LOAD PROTECTION    | 110 %~ 150 %                           | I/P:230 VAC<br>O/P:TESTING<br>Ta:25℃     | 129.27%/230VAC<br>Hiccup Mode   | P       |
| 2  | OVER VOLTAGE PROTECTION | CH1: 27.6V~ 32.4 V                     | I/P: 230 VAC<br>O/P:MIN LOAD<br>Ta:25℃   | 29.7 V/ 230 VAC<br>Hiccup Model | P       |
| 3  | SHORT PROTECTION        | SHORT EVERY OUTPUT<br>1 HOUR NO DAMAGE | I/P: 264 VAC<br>O/P: Full LOAD<br>Ta:25℃ | NO DAMAGE<br>Hiccup Mode        | P       |

**ENVIRONMENT TEST**

| NO | TEST ITEM                                                         | SPECIFICATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | TEST CONDITION                                                  | RESULT                      | VERDICT |          |     |                            |                             |   |    |                     |         |         |   |    |                 |         |         |   |     |                 |         |         |   |     |        |         |         |   |    |         |         |         |   |     |          |         |         |   |     |          |         |         |   |    |           |         |         |   |    |                 |         |         |    |     |                   |         |         |    |         |         |         |         |    |     |                    |         |         |   |
|----|-------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|-----------------------------|---------|----------|-----|----------------------------|-----------------------------|---|----|---------------------|---------|---------|---|----|-----------------|---------|---------|---|-----|-----------------|---------|---------|---|-----|--------|---------|---------|---|----|---------|---------|---------|---|-----|----------|---------|---------|---|-----|----------|---------|---------|---|----|-----------|---------|---------|---|----|-----------------|---------|---------|----|-----|-------------------|---------|---------|----|---------|---------|---------|---------|----|-----|--------------------|---------|---------|---|
| 1  | TEMPERATURE RISE TEST                                             | <div>MODEL : NES-150-24</div> <div>1. ROOM AMBIENT BURN-IN : 1.5 HRS</div> <div>I/P: 230 VAC O/P: FULL LOAD Ta= 33.5 °C</div> <div>2. HIGH AMBIENT BURN-IN : 2 HRS</div> <div>I/P: 230 VAC O/P: FULL LOAD Ta= 43.8 °C</div> <table><tr><th>NO</th><th>Position</th><th>P/N</th><th>ROOM AMBIENT<br/>Ta=33.5 °C</th><th>HIGH AMBIENT<br/>Ta= 43.8 °C</th></tr><tr><td>1</td><td>C5</td><td>330U/200V 105 °C HP</td><td>69.9 °C</td><td>75.9 °C</td></tr><tr><td>2</td><td>D1</td><td>BYV26EGP 1A/1KV</td><td>87.3 °C</td><td>93.8 °C</td></tr><tr><td>3</td><td>BD1</td><td>KBJ608G 6A/800V</td><td>78.4 °C</td><td>83.8 °C</td></tr><tr><td>4</td><td>LF1</td><td>LF-058</td><td>61.2 °C</td><td>66.6 °C</td></tr><tr><td>5</td><td>R3</td><td>150K/2W</td><td>78.5 °C</td><td>84.1 °C</td></tr><tr><td>6</td><td>ZD1</td><td>P6KE300A</td><td>83.1 °C</td><td>88.9 °C</td></tr><tr><td>7</td><td>ZD3</td><td>P6KE200A</td><td>78.6 °C</td><td>83.0 °C</td></tr><tr><td>8</td><td>U1</td><td>P1216AP06</td><td>75.8 °C</td><td>79.9 °C</td></tr><tr><td>9</td><td>Q1</td><td>2SK2082 9A/900V</td><td>81.5 °C</td><td>88.7 °C</td></tr><tr><td>10</td><td>D60</td><td>S20LC20U 20A/200V</td><td>81.1 °C</td><td>87.8 °C</td></tr><tr><td>11</td><td>T1 COIL</td><td>TF-1058</td><td>88.9 °C</td><td>94.3 °C</td></tr><tr><td>12</td><td>C10</td><td>220U/35V 105 °C GL</td><td>71.6 °C</td><td>74.6 °C</td></tr></table> |                                                                 |                             | NO      | Position | P/N | ROOM AMBIENT<br>Ta=33.5 °C | HIGH AMBIENT<br>Ta= 43.8 °C | 1 | C5 | 330U/200V 105 °C HP | 69.9 °C | 75.9 °C | 2 | D1 | BYV26EGP 1A/1KV | 87.3 °C | 93.8 °C | 3 | BD1 | KBJ608G 6A/800V | 78.4 °C | 83.8 °C | 4 | LF1 | LF-058 | 61.2 °C | 66.6 °C | 5 | R3 | 150K/2W | 78.5 °C | 84.1 °C | 6 | ZD1 | P6KE300A | 83.1 °C | 88.9 °C | 7 | ZD3 | P6KE200A | 78.6 °C | 83.0 °C | 8 | U1 | P1216AP06 | 75.8 °C | 79.9 °C | 9 | Q1 | 2SK2082 9A/900V | 81.5 °C | 88.7 °C | 10 | D60 | S20LC20U 20A/200V | 81.1 °C | 87.8 °C | 11 | T1 COIL | TF-1058 | 88.9 °C | 94.3 °C | 12 | C10 | 220U/35V 105 °C GL | 71.6 °C | 74.6 °C | P |
| NO | Position                                                          | P/N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ROOM AMBIENT<br>Ta=33.5 °C                                      | HIGH AMBIENT<br>Ta= 43.8 °C |         |          |     |                            |                             |   |    |                     |         |         |   |    |                 |         |         |   |     |                 |         |         |   |     |        |         |         |   |    |         |         |         |   |     |          |         |         |   |     |          |         |         |   |    |           |         |         |   |    |                 |         |         |    |     |                   |         |         |    |         |         |         |         |    |     |                    |         |         |   |
| 1  | C5                                                                | 330U/200V 105 °C HP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 69.9 °C                                                         | 75.9 °C                     |         |          |     |                            |                             |   |    |                     |         |         |   |    |                 |         |         |   |     |                 |         |         |   |     |        |         |         |   |    |         |         |         |   |     |          |         |         |   |     |          |         |         |   |    |           |         |         |   |    |                 |         |         |    |     |                   |         |         |    |         |         |         |         |    |     |                    |         |         |   |
| 2  | D1                                                                | BYV26EGP 1A/1KV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 87.3 °C                                                         | 93.8 °C                     |         |          |     |                            |                             |   |    |                     |         |         |   |    |                 |         |         |   |     |                 |         |         |   |     |        |         |         |   |    |         |         |         |   |     |          |         |         |   |     |          |         |         |   |    |           |         |         |   |    |                 |         |         |    |     |                   |         |         |    |         |         |         |         |    |     |                    |         |         |   |
| 3  | BD1                                                               | KBJ608G 6A/800V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 78.4 °C                                                         | 83.8 °C                     |         |          |     |                            |                             |   |    |                     |         |         |   |    |                 |         |         |   |     |                 |         |         |   |     |        |         |         |   |    |         |         |         |   |     |          |         |         |   |     |          |         |         |   |    |           |         |         |   |    |                 |         |         |    |     |                   |         |         |    |         |         |         |         |    |     |                    |         |         |   |
| 4  | LF1                                                               | LF-058                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 61.2 °C                                                         | 66.6 °C                     |         |          |     |                            |                             |   |    |                     |         |         |   |    |                 |         |         |   |     |                 |         |         |   |     |        |         |         |   |    |         |         |         |   |     |          |         |         |   |     |          |         |         |   |    |           |         |         |   |    |                 |         |         |    |     |                   |         |         |    |         |         |         |         |    |     |                    |         |         |   |
| 5  | R3                                                                | 150K/2W                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 78.5 °C                                                         | 84.1 °C                     |         |          |     |                            |                             |   |    |                     |         |         |   |    |                 |         |         |   |     |                 |         |         |   |     |        |         |         |   |    |         |         |         |   |     |          |         |         |   |     |          |         |         |   |    |           |         |         |   |    |                 |         |         |    |     |                   |         |         |    |         |         |         |         |    |     |                    |         |         |   |
| 6  | ZD1                                                               | P6KE300A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 83.1 °C                                                         | 88.9 °C                     |         |          |     |                            |                             |   |    |                     |         |         |   |    |                 |         |         |   |     |                 |         |         |   |     |        |         |         |   |    |         |         |         |   |     |          |         |         |   |     |          |         |         |   |    |           |         |         |   |    |                 |         |         |    |     |                   |         |         |    |         |         |         |         |    |     |                    |         |         |   |
| 7  | ZD3                                                               | P6KE200A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 78.6 °C                                                         | 83.0 °C                     |         |          |     |                            |                             |   |    |                     |         |         |   |    |                 |         |         |   |     |                 |         |         |   |     |        |         |         |   |    |         |         |         |   |     |          |         |         |   |     |          |         |         |   |    |           |         |         |   |    |                 |         |         |    |     |                   |         |         |    |         |         |         |         |    |     |                    |         |         |   |
| 8  | U1                                                                | P1216AP06                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 75.8 °C                                                         | 79.9 °C                     |         |          |     |                            |                             |   |    |                     |         |         |   |    |                 |         |         |   |     |                 |         |         |   |     |        |         |         |   |    |         |         |         |   |     |          |         |         |   |     |          |         |         |   |    |           |         |         |   |    |                 |         |         |    |     |                   |         |         |    |         |         |         |         |    |     |                    |         |         |   |
| 9  | Q1                                                                | 2SK2082 9A/900V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 81.5 °C                                                         | 88.7 °C                     |         |          |     |                            |                             |   |    |                     |         |         |   |    |                 |         |         |   |     |                 |         |         |   |     |        |         |         |   |    |         |         |         |   |     |          |         |         |   |     |          |         |         |   |    |           |         |         |   |    |                 |         |         |    |     |                   |         |         |    |         |         |         |         |    |     |                    |         |         |   |
| 10 | D60                                                               | S20LC20U 20A/200V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 81.1 °C                                                         | 87.8 °C                     |         |          |     |                            |                             |   |    |                     |         |         |   |    |                 |         |         |   |     |                 |         |         |   |     |        |         |         |   |    |         |         |         |   |     |          |         |         |   |     |          |         |         |   |    |           |         |         |   |    |                 |         |         |    |     |                   |         |         |    |         |         |         |         |    |     |                    |         |         |   |
| 11 | T1 COIL                                                           | TF-1058                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 88.9 °C                                                         | 94.3 °C                     |         |          |     |                            |                             |   |    |                     |         |         |   |    |                 |         |         |   |     |                 |         |         |   |     |        |         |         |   |    |         |         |         |   |     |          |         |         |   |     |          |         |         |   |    |           |         |         |   |    |                 |         |         |    |     |                   |         |         |    |         |         |         |         |    |     |                    |         |         |   |
| 12 | C10                                                               | 220U/35V 105 °C GL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 71.6 °C                                                         | 74.6 °C                     |         |          |     |                            |                             |   |    |                     |         |         |   |    |                 |         |         |   |     |                 |         |         |   |     |        |         |         |   |    |         |         |         |   |     |          |         |         |   |     |          |         |         |   |    |           |         |         |   |    |                 |         |         |    |     |                   |         |         |    |         |         |         |         |    |     |                    |         |         |   |
| 2  | OVER LOAD BURN-IN TEST                                            | NO DAMAGE<br>1 HOUR ( MIN )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | I/P: 230 VAC<br>O/P: 117%LOAD<br>Ta:25 °C                       | TEST : OK                   | P       |          |     |                            |                             |   |    |                     |         |         |   |    |                 |         |         |   |     |                 |         |         |   |     |        |         |         |   |    |         |         |         |   |     |          |         |         |   |     |          |         |         |   |    |           |         |         |   |    |                 |         |         |    |     |                   |         |         |    |         |         |         |         |    |     |                    |         |         |   |
| 3  | LOW TEMPERATURE<br>TURN ON TEST                                   | TURN ON AFTER 2 HOUR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | I/P: 230 VAC<br>O/P: 100% LOAD<br>Ta= -25 °C                    | TEST : OK                   | P       |          |     |                            |                             |   |    |                     |         |         |   |    |                 |         |         |   |     |                 |         |         |   |     |        |         |         |   |    |         |         |         |   |     |          |         |         |   |     |          |         |         |   |    |           |         |         |   |    |                 |         |         |    |     |                   |         |         |    |         |         |         |         |    |     |                    |         |         |   |
| 4  | HIGH HUMIDITY<br>HIGH TEMPERATURE<br>HIGH VOLTAGE<br>TURN ON TEST | AFTER 12 HOURS<br>IN CHAMBER ON<br>CONTROL 45 °C<br>NO DAMAGE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | I/P: 272 VAC<br>O/P:FULL LOAD<br>Ta= 45 °C<br>HUMIDITY= 95 %R.H | TEST : OK                   | P       |          |     |                            |                             |   |    |                     |         |         |   |    |                 |         |         |   |     |                 |         |         |   |     |        |         |         |   |    |         |         |         |   |     |          |         |         |   |     |          |         |         |   |    |           |         |         |   |    |                 |         |         |    |     |                   |         |         |    |         |         |         |         |    |     |                    |         |         |   |
| 5  | TEMPERATURE<br>COEFFICIENT                                        | ± 0.03 %(0~50 °C)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | I/P: 230 VAC<br>O/P:FULL LOAD                                   | ± 0.01 %(0~50 °C)           | P       |          |     |                            |                             |   |    |                     |         |         |   |    |                 |         |         |   |     |                 |         |         |   |     |        |         |         |   |    |         |         |         |   |     |          |         |         |   |     |          |         |         |   |    |           |         |         |   |    |                 |         |         |    |     |                   |         |         |    |         |         |         |         |    |     |                    |         |         |   |
| 6  | VIBRATION TEST                                                    | 1 Set<br>(1) Waveform: Sine Wave<br>(2) Frequency:10~500Hz<br>(3) Sweep Time:10min/sweep cycle<br>(4) Acceleration:5G<br>(5) Test Time:1 hour in each axis (X.Y.Z)<br>(6) Ta:25 °C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                 | TEST : OK                   | P       |          |     |                            |                             |   |    |                     |         |         |   |    |                 |         |         |   |     |                 |         |         |   |     |        |         |         |   |    |         |         |         |   |     |          |         |         |   |     |          |         |         |   |    |           |         |         |   |    |                 |         |         |    |     |                   |         |         |    |         |         |         |         |    |     |                    |         |         |   |

**SAFETY TEST**

| NO | TEST ITEM            | SPECIFICATION                                                       | TEST CONDITION                                                                   | RESULT                                                               | VERDICT |
|----|----------------------|---------------------------------------------------------------------|----------------------------------------------------------------------------------|----------------------------------------------------------------------|---------|
| 1  | WITHSTAND VOLTAGE    | I/P-O/P: 3 KVAC/min<br>I/P-FG: 1.5 KVAC/min<br>O/P-FG: 0.5 KVAC/min | I/P-O/P: 3.6 KVAC/min<br>I/P-FG: 1.8 KVAC/min<br>O/P-FG: 0.6 KVAC/min<br>Ta:25°C | I/P-O/P: 7.58 mA<br>I/P-FG: 6.48 mA<br>O/P-FG: 7.35 mA<br>NO DAMAGE  | P       |
| 2  | ISOLATION RESISTANCE | I/P-O/P:500VDC>100MΩ<br>I/P-FG: 500VDC>100MΩ<br>O/P-FG:500VDC>100MΩ | I/P-O/P: 500 VDC<br>I/P-FG: 500 VDC<br>O/P-FG: 500 VDC<br>Ta:25°C                | I/P-O/P: 11.1 G Ω<br>I/P-FG: 4.75G Ω<br>O/P-FG: 4.91G Ω<br>NO DAMAGE | P       |
| 3  | GROUNDING CONTINUITY | FG(PE) TO CHASSIS<br>OR TRACE < 100 mΩ                              | 40 A / 2min<br>Ta:25°C                                                           | 8 mΩ                                                                 | P       |
| 4  | APPROVAL             | TUV: Certificate NO :<br>UL: File NO :                              |                                                                                  |                                                                      | N/A     |

**E.M.C TEST**

| NO | TEST ITEM                                   | SPECIFICATION                                      | TEST CONDITION                                      | RESULT                        | VERDICT |
|----|---------------------------------------------|----------------------------------------------------|-----------------------------------------------------|-------------------------------|---------|
| 1  | HARMONIC                                    | EN61000-3-2<br>CLASS A                             | I/P: 230 VAC/50HZ<br>O/P:FULL LOAD<br>Ta:25°C       | PASS                          | P       |
| 2  | CONDUCTION                                  | EN55022<br>CLASS B                                 | I/P: 230 VAC (50HZ)<br>O/P:FULL/50% LOAD<br>Ta:25°C | PASS<br>Test by certified Lab | P       |
| 3  | RADIATION                                   | EN55022<br>CLASS B                                 | I/P: 230 VAC (50HZ)<br>O/P:FULL LOAD<br>Ta:25°C     | PASS<br>Test by certified Lab | P       |
| 4  | E.S.D                                       | EN61000-4-2<br>INDUSTRY<br>AIR:8KV / Contact:4KV   | I/P: 230 VAC/50HZ<br>O/P:FULL LOAD<br>Ta:25°C       | CRITERIA A                    | P       |
| 5  | E.F.T                                       | EN61000-4-4<br>INDUSTRY<br>INPUT: 2KV              | I/P: 230 VAC/50HZ<br>O/P:FULL LOAD<br>Ta:25°C       | CRITERIA A                    | P       |
| 6  | SURGE                                       | IEC61000-4-5<br>INDUSTRY<br>L-N :2KV<br>L,N-PE:4KV | I/P: 230 VAC/50HZ<br>O/P:FULL LOAD<br>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<br>LIFE CYCLE        | SUPPOSE C66 IS THE MOST CRITICAL COMPONENT<br>I/P: 230 VAC O/P: FULL LOAD Ta= 25 °C LIFE TIME= 199209 HRS<br>I/P: 230 VAC O/P: FULL LOAD Ta= 50 °C LIFE TIME= 48076 HRS |                |        | P       |
| 2  | MTBF                           | MIL-HDBK-217F NOTICES2 PARTS COUNT<br>TOTAL FAILURE RATE: 244K HRS                                                                                                      |                |        | P       |
| 3  | ORT (Ongoing Reliability test) | NES-150-24: I/P : 230VAC O/P : FULL LOAD TA=50°C Sample=10pcs TEST TIME=576HRS                                                                                          |                |        | P       |

**COMPONENT STRESS TEST**

| NO | TEST ITEM                                              | SPECIFICATION                                       | TEST CONDITION                                                                                                                | RESULT                                               | VERDICT |
|----|--------------------------------------------------------|-----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|---------|
| 1  | Power Transistor<br>( D to S) or (C to E) Peak Voltage | Q1 Rated<br>2SK2082 : 900V/ 9 A                     | I/P: High-Line +3V =267 V<br>O/P: (1) Full Load Input on/off<br>(2) Output Short<br>Ta: 25°C                                  | (1) 720 V<br>(2) 788 V                               | P       |
| 2  | Diode Peak Voltage                                     | D60 Rated<br>S20LC20U : 200V/ 20 A                  | I/P: High-Line +3V =267 V<br>O/P: (1) Full Load Input on/off<br>(2) Output Short<br>Ta: 25°C                                  | (1) 116 V<br>(2) 116 V                               | P       |
| 3  | Clamp Diode Peak Voltage                               | D1 Rated<br>byv26e: 1K V/ 1 A                       | I/P: High-Line +3V =267 V<br>O/P: (1) Dynamic Load<br>90%Duty/1KHz<br>Ta: 25°C                                                | (1) 700 V                                            | P       |
| 4  | Input Capacitor Voltage                                | C5 Rated<br>CAPXON: 330u /200 V<br>105°C /HP Series | I/P: High-Line +3V =267 V<br>O/P: (1) Full Load input on /Off<br>(2) Min load input on /Off<br>(3) Burn-IN 1 Hour<br>Ta: 25°C | (1) 186 V<br>(2) 187 V<br>(3) 184 V                  | P       |
| 5  | Control IC Voltage Test                                | U1 Rated<br>NCP1216A : 16 V                         | I/P: High-Line +3V =267 V<br>O/P: (1) Output Short<br>(2) O.L.P<br>(3) ON LOAD VR 下限. LOW LINE<br>Ta: 25°C                    | (1) 12.7 V<br>(2) 13.2 V<br>(3) 12.7 V<br>(4) 11.2 V | P       |

| DATE      | SAMPLE    | TEST RESULT | TESTER        | APPROVAL |
|-----------|-----------|-------------|---------------|----------|
| 2007/4/19 | RD SAMPLE | PASS        | VINCENT TSENG | MAX LIN  |

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