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## NTE5700 thru NTE5705 Industrial Power Module

### **Description:**

The NTE5700 through NTE5705 series of Integrated Power Circuits consist of power thyristors and power diodes configured in a single package. Applications include power supplies, control circuits and battery chargers.

### **Features:**

- D Glass Passivated Junctions for Greater Reliability
- D Electrically Isolated Base Plate
- D High Dynamic Characteristics

### **Absolute Maximum Ratings:**

|                                                                              |       |
|------------------------------------------------------------------------------|-------|
| Maximum Repetitive Peak Reverse Voltage ( $V_S \leq 0$ ), $V_{RRM}$ .....    | 1200V |
| Maximum Non-Repetitive Peak Reverse Voltage, $V_{RSM}$ .....                 | 1300V |
| Maximum Repetitive Peak Off State Voltage Gate Open Circuit, $V_{DRM}$ ..... | 1200V |

### **Thermal and Mechanical Characteristics:**

|                                                                                                       |                |
|-------------------------------------------------------------------------------------------------------|----------------|
| Junction Operating Temperature Range, $T_J$ .....                                                     | -40° to +125°C |
| Storage Temperature Range, $T_{stg}$ .....                                                            | -40° to +150°C |
| Maximum Internal Thermal Resistance, One Junction to Case, $R_{thJC}$<br>DC Operation .....           | 2.24K/W        |
| Maximum Thermal Resistance, Base to Heatsink, $R_{thCS}$<br>Mounting Surface Smooth and Greased ..... | 0.10K/W        |
| Mounting Torque, Base to Heatsink $\pm 10\%$ (Note 1), T .....                                        | 5Nm            |
| Approximate Weight, wt .....                                                                          | 58g (2.0oz)    |

Note 1. A mounting compound is recommended and the torque should be checked after a period of about 3 hours to allow for the spread of the compound.



## Electrical Characteristics:

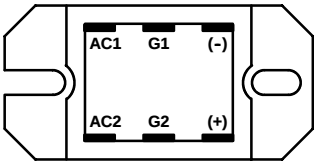
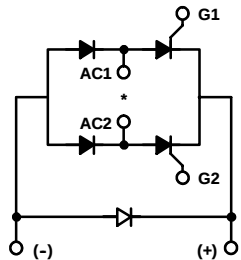
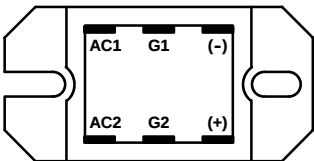
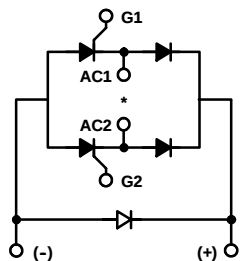
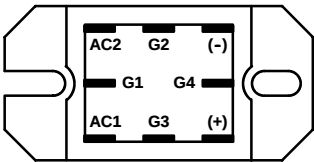
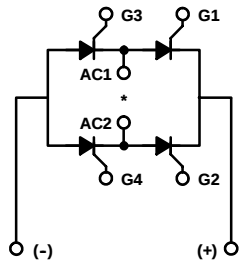
| Parameter                                                          | Symbol                                   | Test Conditions                                                                                                                                                      |                                        |                                                                   | Rating | Unit              |
|--------------------------------------------------------------------|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|-------------------------------------------------------------------|--------|-------------------|
| Forward Conduction                                                 |                                          |                                                                                                                                                                      |                                        |                                                                   |        |                   |
| Maximum DC Output Current                                          | I <sub>O</sub>                           | T <sub>C</sub> = +85°C, Full Bridge Circuits (NTE5700, NTE5701, NTE5702)                                                                                             |                                        |                                                                   | 25     | A                 |
| Maximum Average On-State and Forward Current                       | I <sub>T(AV)</sub><br>I <sub>F(AV)</sub> | 180° Sine Wave Conduction Circuits (All Types)                                                                                                                       |                                        |                                                                   | 12.5   | A                 |
| Maximum RMS Current                                                | I <sub>RMS</sub>                         | 180° Sine Wave Conduction Circuit (NTE5702)                                                                                                                          |                                        |                                                                   | 28     | A                 |
| Maximum Peak, One-Cycle Non-Repetitive On-State or Forward Current | I <sub>TSM</sub> or I <sub>FSM</sub>     | 10ms                                                                                                                                                                 | 100% V <sub>RRM</sub> Reapplied        | Sinusoidal Half Wave, Initial T <sub>J</sub> = T <sub>J</sub> Max | 300    | A                 |
|                                                                    |                                          | 8.3ms                                                                                                                                                                |                                        |                                                                   | 315    | A                 |
|                                                                    |                                          | 10ms                                                                                                                                                                 | No Voltage Reapplied                   |                                                                   | 357    | A                 |
|                                                                    |                                          | 8.3ms                                                                                                                                                                |                                        |                                                                   | 375    | A                 |
| Maximum I <sup>2</sup> t for Fusing                                | I <sup>2</sup> t                         | 10ms                                                                                                                                                                 | 100% V <sub>RRM</sub> Reapplied        | Initial T <sub>J</sub> = T <sub>J</sub> Max                       | 450    | A <sup>2</sup> s  |
|                                                                    |                                          | 8.3ms                                                                                                                                                                |                                        |                                                                   | 410    | A <sup>2</sup> s  |
|                                                                    |                                          | 10ms                                                                                                                                                                 | No Voltage Reapplied                   |                                                                   | 637    | A <sup>2</sup> s  |
|                                                                    |                                          | 8.3ms                                                                                                                                                                |                                        |                                                                   | 580    | A <sup>2</sup> s  |
| Maximum I <sup>2</sup> √t for Fusing                               | I <sup>2</sup> √t                        | t = 0.1 to 10ms, No Voltage Reapplied, Note 2                                                                                                                        |                                        |                                                                   | 6365   | A <sup>2</sup> √s |
| Maximum Value of Threshold Voltage                                 | V <sub>T(TO)</sub>                       | T <sub>J</sub> = +125°C                                                                                                                                              |                                        |                                                                   | 0.82   | V                 |
| Maximum Value of On-State Slope Resistance                         | r <sub>T</sub>                           | T <sub>J</sub> = +125°C                                                                                                                                              |                                        |                                                                   | 12     | mΩ                |
| Maximum Peak On-State or Forward Voltage                           | V <sub>TM</sub>                          | I <sub>TM</sub> = π × I <sub>T(AV)</sub>                                                                                                                             | T <sub>J</sub> = +25°C, 180° Condition |                                                                   | 1.35   | V                 |
|                                                                    | V <sub>FM</sub>                          | I <sub>FM</sub> = π × I <sub>F(AV)</sub>                                                                                                                             |                                        |                                                                   | 1.35   | V                 |
| Maximum Non-Repetitive Rate of Rise of Turned On Circuit           | di/dt                                    | T <sub>J</sub> = +125°C, from 0.67V <sub>DRM</sub> , I <sub>TM</sub> = π × I <sub>T(AV)</sub> , I <sub>g</sub> = 500mA, t <sub>r</sub> < 0.5μs, t <sub>p</sub> > 6μs |                                        |                                                                   | 200    | A/μs              |
| Maximum Holding Current                                            | I <sub>H</sub>                           | T <sub>J</sub> = +25°C, Anode Supply = 6V, Resistive Load, Gate Open Circuit                                                                                         |                                        |                                                                   | 100    | mA                |
| Maximum Latching Current                                           | I <sub>L</sub>                           | T <sub>J</sub> = +25°C, Anode Supply = 6V, Resistive Load                                                                                                            |                                        |                                                                   | 250    | mA                |
| Triggering                                                         |                                          |                                                                                                                                                                      |                                        |                                                                   |        |                   |
| Maximum Peak Gate Power                                            | P <sub>GM</sub>                          |                                                                                                                                                                      |                                        |                                                                   | 8.0    | W                 |
| Maximum Average Gate Power                                         | P <sub>G(AV)</sub>                       |                                                                                                                                                                      |                                        |                                                                   | 2.0    | W                 |
| Maximum Peak Gate Current                                          | I <sub>GM</sub>                          |                                                                                                                                                                      |                                        |                                                                   | 2.0    | A                 |
| Maximum Peak Negative Gate Voltage                                 | -V <sub>GM</sub>                         |                                                                                                                                                                      |                                        |                                                                   | 10     | V                 |
| Maximum Gate Voltage Required to Trigger                           | V <sub>GT</sub>                          | T <sub>J</sub> = -40°C                                                                                                                                               |                                        | Anode Supply = 6V Resistive Load                                  | 3.0    | V                 |
|                                                                    |                                          | T <sub>J</sub> = +25°C                                                                                                                                               |                                        |                                                                   | 2.0    | V                 |
|                                                                    |                                          | T <sub>J</sub> = +125°C                                                                                                                                              |                                        |                                                                   | 1.0    | V                 |

### Electrical Characteristics (Cont'd):

| Parameter                                                                                 | Symbol           | Test Conditions                                                                  |                                     | Rating | Unit |
|-------------------------------------------------------------------------------------------|------------------|----------------------------------------------------------------------------------|-------------------------------------|--------|------|
| Triggering (Cont'd)                                                                       |                  |                                                                                  |                                     |        |      |
| Maximum Gate Current Required to Trigger                                                  | I <sub>GT</sub>  | T <sub>J</sub> = -40°C                                                           | Anode Supply = 6V<br>Resistive Load | 90     | mA   |
|                                                                                           |                  | T <sub>J</sub> = +25°C                                                           |                                     | 60     | mA   |
|                                                                                           |                  | T <sub>J</sub> = +125°C                                                          |                                     | 35     | mA   |
| Maximum Gate Voltage that will not Trigger                                                | V <sub>GD</sub>  | T <sub>J</sub> = +125°C, Rated V <sub>DRM</sub> Applied                          |                                     | 0.2    | V    |
| Blocking                                                                                  |                  |                                                                                  |                                     |        |      |
| Maximum Critical Rate of Rise of Off-State Voltage                                        | dv/dt            | T <sub>J</sub> = +125°C, Exponential to 0.67V <sub>DRM</sub> , Gate Open Circuit |                                     | 200    | V/μs |
| Maximum Peak Reverse and Off-State Leakage Current at V <sub>R</sub> RM, V <sub>DRM</sub> | I <sub>RM</sub>  | T <sub>J</sub> = T <sub>J</sub> Max, Gate Open Circuit                           |                                     | 10     | mA   |
|                                                                                           | I <sub>DM</sub>  |                                                                                  |                                     | 2.0    | mA   |
| RMS Isolation Voltage                                                                     | V <sub>INS</sub> | 50Hz, Circuit to Base, All Terminals Shorted                                     |                                     | 2500   | V    |

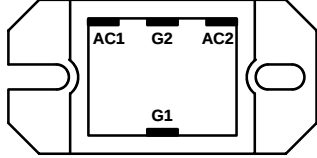
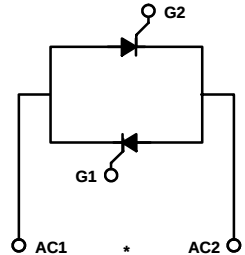
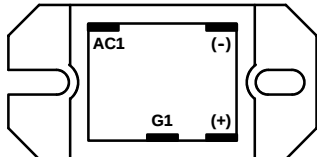
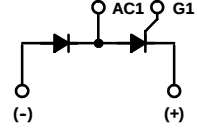
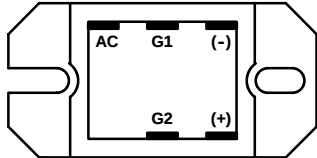
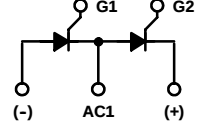
Note 2.  $I^2t$  for time  $t_x = I^2 \sqrt{t} - \sqrt{t_x}$ .

### Pin Connection and Schematic Diagrams:

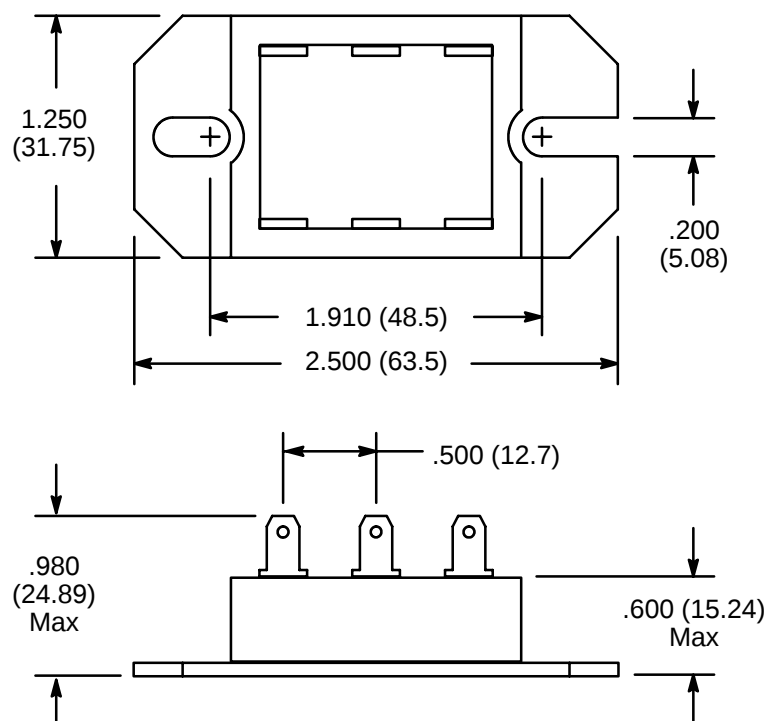
| NTE No.     | Description                                                     | Terminal Positions                                                                  | Schematic Diagrams                                                                    |
|-------------|-----------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| <b>5700</b> | Single Phase, Hybrid Bridge, Common Cathode, Freewheeling Diode |  |  |
| <b>5701</b> | Single Phase, Hybrid Bridge, Common Anode, Freewheeling Diode   |  |  |
| <b>5702</b> | Single Phase, All SCR Bridge                                    |  |  |

\* For transient protection, a Metal Oxide Varistor (MOV) may be connected externally across terminals AC1 & AC2.

### Pin Connection and Schematic Diagrams (Cont'd):

| NTE No. | Description    | Terminal Positions                                                                 | Schematic Diagrams                                                                    |
|---------|----------------|------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 5703    | SCR AC Switch  |   |    |
| 5704    | Hybrid Doubler |   |    |
| 5705    | SCR Doubler    |  |  |

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**NOTE:** Can be used with Heat Sink NTE441A