DESCRIPTION
The TM650 series comprising single and multiple output models for 650-700 watts of continuous output power is specially designed for medical applications not for life support. They operate at 90 to 264VAC input voltage without the need of a selector strap. The units are constructed on a printed circuit board with a U-bracket for mechanical support and heat sinking. A cover-and-fan assembly can be added during manufacturing.

FEATURES
- EN61000-3-2 class A and D compliant
- Power Factor 0.98 typical
- Overvoltage protection
- Short-circuit protection
- Thermal protection
- Power Fail Detect (PFD)
- 100% burn-in at full rated load
- Remote sense on output #1 and output #2
- Remote inhibit – TTL high disables output
- Compliant with RoHS requirements

INPUT SPECIFICATIONS
- Input voltage : 90 to 264VAC
- Input frequency : 47 to 63Hz
- Input current : 10A (rms) for 115VAC, 5A (rms) for 230VAC
- Earth leakage current : 100µA max. @ 115VAC, 60Hz, 165µA max. @ 230VAC, 50Hz

OUTPUT SPECIFICATIONS
- Output voltage/current : See rating chart
- Total output power : See rating chart
- Ripple and noise : 2% peak to peak maximum
- Overvoltage protection : Provided on output #1 only; set at 115–140% of its nominal output voltage
- Overcurrent protection : All outputs protected to short circuit conditions
- Temperature coefficient : All outputs ±0.04%/°C maximum
- Transient response : Maximum excursion of 4% or better on all models, recovering to 1% of final value within 500μs after a 25% step load change
- PFD signal : TTL logic high for normal operation and TTL logic low upon loss of input power. This signal appears at least 1ms prior to master output dropping 5% below its nominal value. This signal also provides a minimum delay of 100 ms after master output is within regulation.
- Remote inhibit : Requires an external TTL high level signal to inhibit outputs for standard models.

TM650 SERIES

Safety Standard Approvals:
- UL 60601-1
- CSA C22.2 No. 601.1
- TÜV EN60601-1

ENVIRONMENTAL SPECIFICATIONS
- Operating temperature : 0°C to +70°C
- Storage temperature : -40°C to +85°C
- Relative humidity : 5% to 95% non-condensing
- Derating : Derate from 100% at +50°C linearly to 50% at +70°C

GENERAL SPECIFICATIONS
- Switching frequency : 70KHz ±10KHz
- Power factor : 0.98 typical
- Efficiency : 80% minimum on all models
- Hold-up time : 12 msec minimum at 110VAC
- Line regulation : ±0.2% maximum at full load
- Inrush current : 50amps @115VAC or 100 amps @ 230VAC at 25ºC cold start
- Withstand voltage : 4000VAC from input to output, 1500VAC from input to ground, 500VAC from output to ground
- MTBF : 300,000 hours minimum at full load at 25ºC ambient, calculated per MIL-HDBK-217F

EMC Performance (EN60601-1-2)
- EN55011: Class B conducted, Class A radiated
- EN61000-3-2: Harmonic distortion, Class A and D
- EN61000-3-3: Line flicker
- EN61000-4-2: ESD, ±8KV air and ±6KV contact
- EN61000-4-3: Radiated immunity, 3V/m
- EN61000-4-4: Fast transient/burst, ±2KV
- EN61000-4-5: Surge, ±1KV diff, ±2KV com.
- EN61000-4-6: Conducted immunity, 3Vrms
- EN61000-4-8: Magnetic field immunity, 3A/m
- EN61000-4-11: Voltage dips, 30% reduction for 500ms, 60% reduction for 100ms and >95% reduction for 10ms
# MEDICAL GRADE TM650 SERIES

## OUTPUT VOLTAGE/CURRENT RATING CHART

<table>
<thead>
<tr>
<th></th>
<th></th>
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<td>12V</td>
<td>0A</td>
<td>54.2A</td>
<td>2%</td>
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<td></td>
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<td>650W</td>
</tr>
<tr>
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<td>43.4A</td>
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<td></td>
<td>650W</td>
</tr>
<tr>
<td>TM650-S24</td>
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<td>27.1A</td>
<td>2%</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>650W</td>
</tr>
<tr>
<td>TM650-S27</td>
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<td>24.1A</td>
<td>2%</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>650W</td>
</tr>
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<td></td>
<td>650W</td>
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<td>650W</td>
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<td></td>
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<td>700W</td>
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<td>24V</td>
<td>1.5A</td>
<td>18A</td>
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<td>12V</td>
<td>1.2A</td>
<td>22A</td>
<td>5%</td>
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<td>650W</td>
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<td>18A</td>
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<td>15V</td>
<td>1.0A</td>
<td>18A</td>
<td>5%</td>
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<td>650W</td>
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<td>48V</td>
<td>0.75A</td>
<td>9A</td>
<td>2%</td>
<td>24V</td>
<td>0.6A</td>
<td>12A</td>
<td>5%</td>
<td></td>
<td></td>
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<td>650W</td>
</tr>
<tr>
<td>TM650-D23</td>
<td>48V</td>
<td>0.75A</td>
<td>9A</td>
<td>2%</td>
<td>12V</td>
<td>1.2A</td>
<td>22A</td>
<td>5%</td>
<td></td>
<td></td>
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<td>650W</td>
</tr>
<tr>
<td>TM650-D24</td>
<td>48V</td>
<td>0.75A</td>
<td>9A</td>
<td>2%</td>
<td>15V</td>
<td>1.0A</td>
<td>18A</td>
<td>5%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>650W</td>
</tr>
<tr>
<td>TM650-T30</td>
<td>24V</td>
<td>1.5A</td>
<td>18A</td>
<td>2%</td>
<td>12V</td>
<td>1.2A</td>
<td>22A</td>
<td>5%</td>
<td>3.3V</td>
<td>0A</td>
<td>10A</td>
<td>3%</td>
<td>650W</td>
</tr>
<tr>
<td>TM650-T31</td>
<td>24V</td>
<td>1.5A</td>
<td>18A</td>
<td>2%</td>
<td>15V</td>
<td>1.0A</td>
<td>18A</td>
<td>5%</td>
<td>3.3V</td>
<td>0A</td>
<td>10A</td>
<td>3%</td>
<td>650W</td>
</tr>
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<td>TM650-T32</td>
<td>24V</td>
<td>1.5A</td>
<td>18A</td>
<td>2%</td>
<td>12V</td>
<td>1.2A</td>
<td>22A</td>
<td>5%</td>
<td>5.1V</td>
<td>0A</td>
<td>10A</td>
<td>3%</td>
<td>650W</td>
</tr>
<tr>
<td>TM650-T33</td>
<td>24V</td>
<td>1.5A</td>
<td>18A</td>
<td>2%</td>
<td>15V</td>
<td>1.0A</td>
<td>18A</td>
<td>5%</td>
<td>5.1V</td>
<td>0A</td>
<td>10A</td>
<td>3%</td>
<td>650W</td>
</tr>
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<td>TM650-T34</td>
<td>48V</td>
<td>0.75A</td>
<td>9A</td>
<td>2%</td>
<td>12V</td>
<td>1.2A</td>
<td>22A</td>
<td>5%</td>
<td>3.3V</td>
<td>0A</td>
<td>10A</td>
<td>3%</td>
<td>650W</td>
</tr>
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<td>TM650-T35</td>
<td>48V</td>
<td>0.75A</td>
<td>9A</td>
<td>2%</td>
<td>15V</td>
<td>1.0A</td>
<td>18A</td>
<td>5%</td>
<td>3.3V</td>
<td>0A</td>
<td>10A</td>
<td>3%</td>
<td>650W</td>
</tr>
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<td>TM650-T36</td>
<td>48V</td>
<td>0.75A</td>
<td>9A</td>
<td>2%</td>
<td>12V</td>
<td>1.2A</td>
<td>22A</td>
<td>5%</td>
<td>5.1V</td>
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<td>10A</td>
<td>3%</td>
<td>650W</td>
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<td>TM650-T37</td>
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<td>2%</td>
<td>15V</td>
<td>1.0A</td>
<td>18A</td>
<td>5%</td>
<td>5.1V</td>
<td>0A</td>
<td>10A</td>
<td>3%</td>
<td>650W</td>
</tr>
</tbody>
</table>

**NOTES:**
1. Add suffix "C" for enclosed format with fan control function, e.g. TM650-S24C.
2. All outputs are floating. It can be connected externally for positive or negative output.
3. Output #1 can be adjusted within +/- 5% of their nominal voltage.
4. Output #3 can be adjusted within +/- 15% of their nominal voltage.
5. 650~700 watts for "C" version with cover-and-fan assembly. 325~350 watts for U-bracket version without moving air (maximum current of output #1 and #2 derated to 70%), or 650 watts with 50 CFM forced air provided by user.
6. All models may operated at no-load. At no-load, output voltage tolerance increases to 10%.

## MECHANICAL SPECIFICATIONS

### Single Output Models

![Mechanical Diagram]

**NOTES:**
1. Dimensions shown in inch [mm].
2. Tolerance 0.02 [0.5] maximum.
3. Input connector P1 is Dinkle DT-4C-B01N-03 screws are M3, Nickel plated.
4. Connector P4 mates with Molex housing 50-37-5130 and pins S263.
5. P2-1, P2-2, P3-1 & P3-2: M3*0.5 screw connections.
6. Weight: 2,040 gms.
**MEDICAL GRADE**

**TM650 SERIES**

**MECHANICAL SPECIFICATIONS**

### Multiple Output Models

<table>
<thead>
<tr>
<th>Product No.</th>
<th>CONN PIN</th>
<th>P1 (AC)</th>
<th>P2</th>
<th>P3</th>
<th>P4</th>
</tr>
</thead>
<tbody>
<tr>
<td>TM650-T30</td>
<td>TM650-T31</td>
<td>LIVE</td>
<td>+V</td>
<td>-V</td>
<td>SIGNAL GROUND (-V)</td>
</tr>
<tr>
<td>TM650-T31</td>
<td>TM650-T30</td>
<td>NEUTRAL</td>
<td>+V</td>
<td>-V</td>
<td>+S (V)</td>
</tr>
<tr>
<td>TM650-T32</td>
<td>TM650-T33</td>
<td>GROUND</td>
<td>+V</td>
<td>-V</td>
<td>-S (V)</td>
</tr>
<tr>
<td>TM650-T33</td>
<td>TM650-T32</td>
<td></td>
<td>+V</td>
<td>-V</td>
<td>PFD</td>
</tr>
<tr>
<td>TM650-T34</td>
<td>TM650-T35</td>
<td></td>
<td>+V</td>
<td>-V</td>
<td></td>
</tr>
<tr>
<td>TM650-T35</td>
<td>TM650-T34</td>
<td></td>
<td>+V</td>
<td>-V</td>
<td></td>
</tr>
<tr>
<td>TM650-T36</td>
<td>TM650-T37</td>
<td></td>
<td>+V</td>
<td>-V</td>
<td></td>
</tr>
<tr>
<td>TM650-T37</td>
<td>TM650-T36</td>
<td></td>
<td>+V</td>
<td>-V</td>
<td></td>
</tr>
<tr>
<td>TM650-T38</td>
<td>TM650-T39</td>
<td></td>
<td>+V</td>
<td>-V</td>
<td></td>
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</tbody>
</table>

**NOTES:**
1. Dimensions shown in inch [mm]
2. Tolerance 0.02 [0.5] maximum
3. Input connector P1 is Dinkle DT-4C-B01N-03 screws are M3, Nickel plated
5. P2, P3: M3*0.05 screw connections.
6. Output connector P5 is Dinkle DT-35-B01W-06 screws are M3, Nickel plated.
7. Weight: 2,140 gms.

### Single Output Models

<table>
<thead>
<tr>
<th>Product No.</th>
<th>CONN PIN</th>
<th>P1 (AC)</th>
<th>P2</th>
<th>P3</th>
<th>P4</th>
</tr>
</thead>
<tbody>
<tr>
<td>TM650-S12</td>
<td>TM650-S15</td>
<td>LIVE</td>
<td>+V</td>
<td>-V</td>
<td>SIGNAL GROUND (-V)</td>
</tr>
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<td>TM650-S15</td>
<td>TM650-S12</td>
<td>NEUTRAL</td>
<td>+V</td>
<td>-V</td>
<td>+S (V)</td>
</tr>
<tr>
<td>TM650-S24</td>
<td>TM650-S27</td>
<td>GROUND</td>
<td>+V</td>
<td>-V</td>
<td>-S (V)</td>
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<td>TM650-S24</td>
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<td>-V</td>
<td>PFD</td>
</tr>
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<td>TM650-S36</td>
<td></td>
<td>+V</td>
<td>-V</td>
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<td>TM650-S30</td>
<td></td>
<td>+V</td>
<td>-V</td>
<td></td>
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<td>+V</td>
<td>-V</td>
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### Multiple Output Models

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<tr>
<th>Product No.</th>
<th>CONN PIN</th>
<th>P1 (AC)</th>
<th>P2</th>
<th>P3</th>
<th>P4</th>
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<tbody>
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<td>TM650-D21</td>
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<td>+V1</td>
<td>-V1</td>
<td>SIGNAL GROUND (-V)</td>
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<td>+S (V1)</td>
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<td>-V1</td>
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<td>+V1</td>
<td>-V1</td>
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<td>-V1</td>
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<td>+V1</td>
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<td>+V1</td>
<td>-V1</td>
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</tbody>
</table>

**NOTES:**
1. Dimensions shown in inch [mm]
2. Tolerance 0.02 [0.5] maximum
3. Input connector P1 is Dinkle DT-4C-B01N-03 screws are M3, Nickel plated
5. P2, P3: M3*0.05 screw connections.
6. Output connector P5 is Dinkle DT-35-B01W-06 screws are M3, Nickel plated.
7. Weight: 2,140 gms.

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**Tumbler Technologies + TRUMPower**

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