**Z⁺ 600 H.V Series**

**EVALUATION DATA**

<table>
<thead>
<tr>
<th>APPD</th>
<th>CHK</th>
<th>DWG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z</td>
<td>Z</td>
<td>Kami S. Nov-20-14</td>
</tr>
<tr>
<td>2/12/14</td>
<td>2/12/14</td>
<td></td>
</tr>
</tbody>
</table>

DWG No.: IA798-53-02
## INDEX

### 1. EVALUATION METHOD

1.1 Circuit used for determination

(1) Steady state data
(2) Warm up voltage drift characteristics
(3) Warm up current drift characteristics
(4) Over voltage protection (OVP) characteristics
(5) Output voltage rise/fall characteristics
(6) Output current rise/fall characteristics
(7) Dynamic line voltage and current response characteristics
(8) Dynamic load voltage and current response characteristics
(9) Response to brown-out characteristics
(10) Inrush current characteristics
(11) Leakage current characteristics
(12) Output Voltage ripple & noise waveform 160V to 650V models
(13) Output Current ripple & noise waveform 160V to 650V models

1.2 List of equipment used

### 2. CHARACTERISTICS

2.1 Steady state data

(1) Regulation - Line & Load, Temperature drift
(2) Output voltage and ripple voltage v.s input voltage
(3) Output current and ripple current v.s input voltage
(4) Efficiency and Input current vs. Output current

2.2 Warm up voltage drift & temperature stability

2.3 Over voltage protection (OVP) characteristics

2.4 ON/OFF Output rise characteristics

2.5 ON/OFF Output fall characteristics

2.6 Hold up time characteristics

2.7 Dynamic line response characteristics

2.8 Dynamic load response characteristics

2.9 Response to brown-out characteristics

2.10 Inrush current characteristics

2.11 Inrush current waveform

2.12 Input current waveform

2.13 Leakage current characteristics

2.14 Output voltage ripple & noise waveform

### TERMINOLOGY USED

Definition

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vin</td>
<td>Input voltage</td>
</tr>
<tr>
<td>Vout</td>
<td>Output voltage</td>
</tr>
<tr>
<td>lin</td>
<td>Input current</td>
</tr>
<tr>
<td>lout</td>
<td>Output current</td>
</tr>
<tr>
<td>Ta</td>
<td>Ambient temperature</td>
</tr>
<tr>
<td>f</td>
<td>Frequency</td>
</tr>
<tr>
<td>C.V</td>
<td>Constant voltage mode</td>
</tr>
<tr>
<td>C.C</td>
<td>Constant current mode</td>
</tr>
</tbody>
</table>
1. EVALUATION METHOD

1.1 Circuit used for determination

(1) Steady state data

(2) Warm up voltage drift characteristics same as Steady state data

(3) Warm up current drift characteristics same as Steady state data

(4) Over voltage protection (OVP) characteristics

(5) Output voltage rise/fall characteristics same as Steady state data

(6) Output current rise/fall characteristics
1.1 Circuit used for determination

(7) Dynamic line voltage and current response characteristics

(8) Dynamic load voltage and current response characteristics

Constant Voltage mode

Output current waveform
\[ \text{lout } 0\% \rightarrow 100\% \]

Output current waveform
\[ \text{lout } 50\% \rightarrow 100\% \]
1.1 Circuit used for determination

(9) Response to brown-out characteristics

(10) Inrush current characteristics same as Response to brown-out

(11) Leakage current characteristics

(12) Output Voltage ripple & noise waveform 160V up to 650V models

(a) Normal mode (JEITA Standard RC-9131A)
1.1 Circuit used for determination

(12) Output Voltage ripple & noise waveform 160V up to 650V models

(b) Normal + Common mode

(13) Output Current rms ripple 160V to 650V models

Notes:
(*) Output Current rms ripple = Output Voltage rms ripple divided by the Load resistance.
### 1.2 List of equipment used

<table>
<thead>
<tr>
<th>EQUIPMENT USED</th>
<th>MANUFACTURER</th>
<th>MODEL No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Digital oscilloscope</td>
<td>YOKOGAWA</td>
<td>DL1740 E/EL</td>
</tr>
<tr>
<td>2 Digital multimeter</td>
<td>AGILENT</td>
<td>34401A</td>
</tr>
<tr>
<td>3 Digital power meter</td>
<td>YOKOGAWA</td>
<td>WT230 / WT110</td>
</tr>
<tr>
<td>4 AC source</td>
<td>CHROMA</td>
<td>6590/6463/6520/6530</td>
</tr>
<tr>
<td>5 Electronic load</td>
<td>H&amp;H</td>
<td>ZS1880/ZS7060/ZS4260</td>
</tr>
<tr>
<td>6 Electronic load</td>
<td>CHROMA</td>
<td>63202 / 63204</td>
</tr>
<tr>
<td>7 Resistor load</td>
<td>ARCOL</td>
<td>HS100</td>
</tr>
<tr>
<td>8 Leakage current tester</td>
<td>KIKUSUI</td>
<td>TOS3200</td>
</tr>
<tr>
<td>9 Voltage probe</td>
<td>YOKOGAWA</td>
<td>701939/701944</td>
</tr>
<tr>
<td>10 Current probe</td>
<td>YOKOGAWA</td>
<td>701933</td>
</tr>
<tr>
<td>11 Inrush Current Meter</td>
<td>TAKAMISAWA</td>
<td>PSA-210</td>
</tr>
<tr>
<td>12 Data acquisition / switch</td>
<td>AGILENT</td>
<td>34970A</td>
</tr>
<tr>
<td>13 Controlled temp. chamber</td>
<td>THERMOTRON</td>
<td>SM-16-3800</td>
</tr>
<tr>
<td>14 Controlled temp. chamber</td>
<td>THERMOTRON</td>
<td>SM-16-8200</td>
</tr>
<tr>
<td>15 Controlled temp. chamber</td>
<td>THERMOTRON</td>
<td>SE-600-5-5</td>
</tr>
<tr>
<td>16 Controlled temp. chamber</td>
<td>THERMOTRON</td>
<td>SE-600-6-6</td>
</tr>
</tbody>
</table>
2. CHARACTERISTIC

2.1 Steady state data

(1) Regulation - Line & Load, Temperature drift

Conditions: $T_a = 25^\circ C$

1. Regulation - Line & Load, C.V mode (Readings in [V])

<table>
<thead>
<tr>
<th>Io</th>
<th>Vin (AC)</th>
<th>Line Regulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>159.9521</td>
<td>0.7 0.000</td>
</tr>
<tr>
<td>25%</td>
<td>159.9514</td>
<td>0.6 0.000</td>
</tr>
<tr>
<td>50%</td>
<td>159.9523</td>
<td>0.5 0.000</td>
</tr>
<tr>
<td>75%</td>
<td>159.9525</td>
<td>0.4 0.000</td>
</tr>
<tr>
<td>100%</td>
<td>159.9527</td>
<td>0.4 0.000</td>
</tr>
<tr>
<td>Load</td>
<td>1.3 1.0 1.3 1.7</td>
<td>$\Delta V$(mV) (%)</td>
</tr>
</tbody>
</table>
| Regulation | 0.001| 0.001 0.001 0.001 (|%

2. Temperature drift, C.V mode

Conditions: $V_{in}:100$Vac
$I_{out}:100%$

<table>
<thead>
<tr>
<th>Ta</th>
<th>0°C</th>
<th>25°C</th>
<th>50°C</th>
<th>Temp. Coefficient (0°C–50°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vout</td>
<td>159.989</td>
<td>159.973</td>
<td>159.978</td>
<td>16 mV 1.4 ppm/°C</td>
</tr>
</tbody>
</table>
2.1 Steady state data

(1) Regulation - Line & Load, Temperature drift

Conditions: Ta = 25°C

1. Regulation - Line & Load, C.V mode (Readings in [V])

<table>
<thead>
<tr>
<th>Vin (AC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>la</td>
</tr>
<tr>
<td>0%</td>
</tr>
<tr>
<td>25%</td>
</tr>
<tr>
<td>50%</td>
</tr>
<tr>
<td>75%</td>
</tr>
<tr>
<td>100%</td>
</tr>
<tr>
<td>Load</td>
</tr>
<tr>
<td>Regulation</td>
</tr>
</tbody>
</table>

2. Temperature drift, C.V mode

Conditions: Vin:100Vac
Iout:100%

<table>
<thead>
<tr>
<th>Ta</th>
<th>0°C</th>
<th>25°C</th>
<th>50°C</th>
<th>Temp. Coefficient (0°C~50°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vout</td>
<td>650.029</td>
<td>650.022</td>
<td>650.140</td>
<td>118 mV</td>
</tr>
</tbody>
</table>
2.1 Steady state data

(1) Regulation - Line & Load, Temperature drift

Conditions: \( T_a = 25^\circ C \)

1. Regulation - Line & Load, C.C mode (*) (Readings in [A])

<table>
<thead>
<tr>
<th>Vo</th>
<th>Vin (AC)</th>
<th>Line Regulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>4.0003</td>
<td>0.0</td>
</tr>
<tr>
<td>25%</td>
<td>4.0001</td>
<td>0.0</td>
</tr>
<tr>
<td>50%</td>
<td>3.9999</td>
<td>0.1</td>
</tr>
<tr>
<td>75%</td>
<td>3.9996</td>
<td>0.0</td>
</tr>
<tr>
<td>100%</td>
<td>3.9994</td>
<td>0.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Load Regulation</th>
<th>( \Delta I(\text{mA}) ) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.9</td>
<td>0.022</td>
</tr>
<tr>
<td>0.9</td>
<td>0.022</td>
</tr>
<tr>
<td>1.0</td>
<td>0.025</td>
</tr>
<tr>
<td>1.0</td>
<td>0.025</td>
</tr>
</tbody>
</table>

Notes:
(*) Not including load regulation thermal drift effect.

2. Temperature drift, C.C mode

Conditions: \( V_i = 100\text{Vac} \)
\( I_{\text{out}} = 100\% \)

<table>
<thead>
<tr>
<th>Ta</th>
<th>0°C</th>
<th>25°C</th>
<th>50°C</th>
<th>Temp. Coefficient (0°C~50°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.7 mA</td>
</tr>
<tr>
<td>I_{\text{out}}</td>
<td>3.99929</td>
<td>3.99909</td>
<td>3.99995</td>
<td>3.3 ppm/°C</td>
</tr>
</tbody>
</table>
2.1 Steady state data

(1) Regulation - Line & Load, Temperature drift

Conditions: $T_a = 25^\circ C$

1. Regulation - Line & Load, C.C mode (*) (Readings in [A])

<table>
<thead>
<tr>
<th>Vo</th>
<th>Vin (AC)</th>
<th></th>
<th></th>
<th></th>
<th>Line Regulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>1.0002</td>
<td>1.0002</td>
<td>1.0002</td>
<td>1.0002</td>
<td>0.0</td>
</tr>
<tr>
<td>25%</td>
<td>1.0004</td>
<td>1.0004</td>
<td>1.0004</td>
<td>1.0004</td>
<td>0.0</td>
</tr>
<tr>
<td>50%</td>
<td>1.0003</td>
<td>1.0003</td>
<td>1.0003</td>
<td>1.0003</td>
<td>0.0</td>
</tr>
<tr>
<td>75%</td>
<td>1.0003</td>
<td>1.0003</td>
<td>1.0003</td>
<td>1.0003</td>
<td>0.0</td>
</tr>
<tr>
<td>100%</td>
<td>1.0002</td>
<td>1.0002</td>
<td>1.0002</td>
<td>1.0002</td>
<td>0.0</td>
</tr>
<tr>
<td>Load Regulation</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>$\Delta I(mA)$ (%)</td>
</tr>
<tr>
<td></td>
<td>0.020</td>
<td>0.020</td>
<td>0.020</td>
<td>0.020</td>
<td>(%)</td>
</tr>
</tbody>
</table>

Notes:
(*) Not including load regulation thermal drift effect.

2. Temperature drift, C.C mode

Conditions: $V_{in}: 100$Vac

$l_{out}: 100\%$

<table>
<thead>
<tr>
<th>Ta</th>
<th>$0^\circ C$</th>
<th>$25^\circ C$</th>
<th>$50^\circ C$</th>
<th>Temp. Coefficient ($0^\circ C$-$50^\circ C$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$l_{out}$</td>
<td>1.00005</td>
<td>0.99978</td>
<td>1.00020</td>
<td>0.1 mA</td>
</tr>
</tbody>
</table>
2.1 Steady state data

(2) Output voltage and ripple voltage v.s input voltage

C.V mode

Conditions: I_{out}:100\%

<table>
<thead>
<tr>
<th>Temp (°C)</th>
<th>Output voltage (V)</th>
<th>Output noise (P-Pk)</th>
<th>Ripple &amp; noise (mV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>25</td>
<td></td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>50</td>
<td></td>
<td></td>
<td>10</td>
</tr>
</tbody>
</table>

(3) Output current and ripple current v.s input voltage

C.C mode

Conditions: V_{out}:100\%

<table>
<thead>
<tr>
<th>Temp (°C)</th>
<th>Output current (A)</th>
<th>Ripple (mA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>25</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>50</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

TDK-Lambda
2.1 Steady state data

(2) Output voltage and ripple voltage v.s input voltage

C.V mode

Conditions: I_{out}: 100%

<table>
<thead>
<tr>
<th>Temperature</th>
<th>0°C</th>
<th>25°C</th>
<th>50°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ta:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Input voltage (VAC)

Output voltage

Output noise (Pk-Pk)

Output ripple (RMS)

Ripple noise (mV)

(3) Output current and ripple current v.s input voltage

C.C mode

Conditions: V_{out}: 100%

<table>
<thead>
<tr>
<th>Temperature</th>
<th>0°C</th>
<th>25°C</th>
<th>50°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ta:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Input voltage (VAC)

Output current

Output ripple (RMS)

Ripple (mA)
2.1 Steady state data

(4) Efficiency and Input current vs. Output current

Conditions:

Vin: 85 VAC
100VAC
200 VAC
265 VAC
Vout:100%
Ta: 25°C

TDK-Lambda
2.1 Steady state data

(4) Efficiency and input current vs. output current

Conditions:
- Vin: 85 VAC
- 100 VAC
- 200 VAC
- 265 VAC
- Vout: 100%
- Ta: 25°C

Efficiency and input current vs. output current graph.
2.2 Warm up drift & stability

C.V mode

Conditions: Vin: 100 Vac
Vout: 100%
Iout: 100%
Ta = 25°C

C.C mode

TDK-Lambda
2.2 Warm up drift & stability

C.V mode

Conditions: Vin: 100 Vac
Vout: 100%
Iout: 100%
T_a = 25°C

C.C mode
2.3 Over voltage protection characteristics

Conditions:
Vin: 100 Vac
Iout: 0%
Ta = 25°C

OVP setting: 176V

OVP setting: 717V
2.4 ON/OFF Output rise characteristics

C.V mode

Conditions:
Vin: 100 Vac
Vout: 100%
lout: 0%
Iset=105%
Ta = 25°C

Z^+ 600 H.V

Z160-4

Z650-1

TDK-Lambda
2.4 ON/OFF Output rise characteristics

C.V mode

**Z160-4**

Conditions:
- Vin: 100 Vac
- Vout: 100%
- Iout: 100%
- Iset = 105%
- Load: CR
- Ta = 25°C

**Z650-1**

**TDK-Lambda**
2.4 ON/OFF Output rise characteristics

C.C mode

**Z160-4**

Conditions:
- Vin: 100 Vac
- Vout: 100%
- Iout: 100%
- Vset: 105%
- Load: CR
- Ta = 25°C

**Z650-1**

---

TDK-Lambda T-19
2.4 ON/OFF Output rise characteristics

C.C mode

Z160-4

Conditions:
Vin: 100Vac
Iout: 100%
Vset=105%
shorted output
Ta = 25°C

Z650-1

0.5A/Div  20ms/Div

TDK-Lambda
2.5 ON/OFF Output fall characteristics

C.V mode

Conditions:
- Vin: 100 Vac
- Vout: 100%
- Iout: 0%
- Isen = 105%
- Ta = 25°C

Z⁺ 600 H.V

TDK-Lambda
2.5 ON/OFF Output fall characteristics

C.V mode

\[ Z^{+} \ 600 \text{ H.V} \]

Conditions:

- \( V_{in}: 100 \text{ Vac} \)
- \( V_{out}: 100\% \)
- \( I_{out}: 100\% \)
- \( I_{set}: 105\% \)
- Load: CR
- \( T_{a} = 25^\circ\text{C} \)

\[ Z_{160-4} \]

\[ Z_{650-1} \]

TDK-Lambda
2.5 ON/OFF Output fall characteristics

C.C mode

**Z160-4**

Conditions:
- Vin: 100 Vac
- Vout: 100%
- Iout: 100%
- Vset=105%
- Load: CR
- Ta = 25°C

**Z650-1**

:<< Hinz: 250k >>:

- 0.5 A/DIV
- 50 ms/DIV
2.5 ON/OFF Output fall characteristics

C.C mode

Z160-4

Conditions:
Vin: 100Vac
Iout: 100%
Vset: 105%
shorted output
Ta = 25°C

Z650-1

0.5A/ DIV
2ms/ DIV
2.6 Hold up time characteristics

Conditions:
Vin: 100 Vac
Vout: 100%
Ta = 25°C

Z+ 600 H.V

Z160-4

Hold up time (ms)

Output current (%)
2.6 Hold up time characteristics

Conditions:
Vin: 100 Vac
Vout: 100%
Ta = 25°C

![Graph showing hold up time characteristics vs output current.](image-url)
2.7 Dynamic line response characteristics

C.V mode

**Z160-4**

Conditions:
- Vin: 85 → 132V
- Vout: 100%
- Iout: 100%
- Ta = 25°C

**Vout: 100mV/Div**

**500ms/Div**

Conditions:
- Vin: 170 → 265V
- Vout: 100%
- Iout: 100%
- Ta = 25°C

**Vout: 100mV/Div**

**500ms/Div**
2.7 Dynamic line response characteristics

C.V mode

Conditions:
- Vin: 85\text{→}132V
- Vout: 100%
- Iout: 100%
- Ta = 25°C

![Waveform graph for C.V mode with parameters: Vin: 85\text{→}132V, Vout: 100%, Iout: 100%, Ta = 25°C.]

Conditions:
- Vin: 170\text{→}265V
- Vout: 100%
- Iout: 100%
- Ta = 25°C

![Waveform graph for another condition with parameters: Vin: 170\text{→}265V, Vout: 100%, Iout: 100%, Ta = 25°C.]

TDK-Lambda
2.7 Dynamic line response characteristics

C.C mode

**Z160-4**

---

**Conditions:**
Vin: 85 → 132V
Vout: 100%
lout: 100%
Ta = 25°C

---

**Vin**

lout: 50mA/Div 500ms/Div

---

**Conditions:**
Vin: 170 → 265V
Vout: 100%
lout: 100%
Ta = 25°C

---

**Vin**

lout: 50mA/Div 500ms/Div

---
2.7 Dynamic line response characteristics

C.C mode

Conditions: Vin: 85 → 132V
            Vout: 100%
            Iout: 100%
            Ta = 25°C

Conditions: Vin: 170 → 265V
            Vout: 100%
            Iout: 100%
            Ta = 25°C
2.8 Dynamic load response characteristics

C.V mode

<table>
<thead>
<tr>
<th>Conditions: Vin: 100Vac</th>
<th>Vout: 100%</th>
<th>Ta = 25°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load current: tr= tf= 100us</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Z160-4 |
|-----------------|-----------------|
| lout: 0% → 100% | f: 100Hz |
| 0.5 V/Div       | 2 ms/Div       |
| 0.30%           | -0.46%         |

<table>
<thead>
<tr>
<th>lout: 50% → 100%</th>
<th>f: 100Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2 V/Div</td>
<td>2 ms/Div</td>
</tr>
<tr>
<td>0.14%</td>
<td>-0.14%</td>
</tr>
</tbody>
</table>

| Z160-4 |
|-----------------|-----------------|
| lout: 0% → 100% | f: 1000Hz |
| 0.5 V/Div       | 200 μs/Div     |
| 0.22%           | -0.21%         |

<table>
<thead>
<tr>
<th>lout: 50% → 100%</th>
<th>f: 1000Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2 V/Div</td>
<td>200 μs/Div</td>
</tr>
<tr>
<td>0.10%</td>
<td>-0.09%</td>
</tr>
</tbody>
</table>

TDK-Lambda
2.8 Dynamic load response characteristics

C.V mode

Conditions: Vin: 100Vac
Vout: 100%
Ta = 25°C

Load current: tr=tf=100us

**Z650-1**

<table>
<thead>
<tr>
<th>Load (%)</th>
<th>f: 100Hz</th>
<th>2V/Div</th>
<th>2ms/Div</th>
</tr>
</thead>
<tbody>
<tr>
<td>0% to 100%</td>
<td>100Hz</td>
<td>0.22%</td>
<td>-0.55%</td>
</tr>
<tr>
<td>50% to 100%</td>
<td>100Hz</td>
<td>0.22%</td>
<td>-0.22%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Load (%)</th>
<th>f: 1000Hz</th>
<th>1V/Div</th>
<th>200μs/Div</th>
</tr>
</thead>
<tbody>
<tr>
<td>0% to 100%</td>
<td>1000Hz</td>
<td>0.13%</td>
<td>-0.13%</td>
</tr>
<tr>
<td>50% to 100%</td>
<td>1000Hz</td>
<td>0.08%</td>
<td>-0.07%</td>
</tr>
</tbody>
</table>
2.8 Dynamic load response characteristics

C.C mode

Conditions: Vin: 100Vac
Ta = 25°C

<table>
<thead>
<tr>
<th>Z160-4</th>
<th>lo=4A</th>
<th>Vout: 144→120V</th>
<th>f: 10HZ</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0.5A/DIV</td>
<td>20ms/DIV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>13.9%</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Z650-1</th>
<th>lo=1A</th>
<th>Vout: 585→487.5V</th>
<th>f: 10HZ</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0.1A/DIV</td>
<td>20ms/DIV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>14.0%</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>lo=2A</th>
<th>Vout: 144→120V</th>
<th>f: 10HZ</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0.2A/DIV</td>
<td>20ms/DIV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6.9%</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>lo=0.5A</th>
<th>Vout: 585→487.5V</th>
<th>f: 10HZ</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>50mA/DIV</td>
<td>20ms/DIV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8.6%</td>
<td></td>
</tr>
</tbody>
</table>

TDK-Lambda
2.9 Response to brown-out characteristics

C.V mode

Conditions:

Vin: 100VAC
Vout: 100%
lout: 100%
Ta = 25°C

Brown-out time
A - 22mS
C - 23mS

Vout: 50V/Div
100ms/Div
2.9 Response to brown-out characteristics

C.V mode

Conditions:
- Vin: 100VAC
- Vout: 100%
- Iout: 100%
- Ta = 25°C

Brown-out time:
- A - 19ms
- C - 23ms

Vout: 200V/Div
100ms/Div
2.9 Response to brown-out characteristics

C.C mode

Conditions:
- Vin: 100VAC
- Vout: 100%
- Iout: 100%
- Ta = 25°C

Z160-4

Brown-out time
- A - 23mS
- C - 48mS

iout: 1A/DIV

50ms/DIV
2.9 Response to brown-out characteristics

C.C mode

Conditions:
- Vin: 100VAC
- Vout: 100%
- Iout: 100%
- Ta = 25°C

Brown-out time:
- A: 19mS
- C: 48mS

Z<sup>+</sup> 600 H.V

[Diagram showing current and voltage characteristics with scales: Iout: 0.5A/Div, 100ms/Div]
2.10 Inrush Current Characteristics
during line brown outs

Conditions: Vin: 100VAC
Vout: 100%
Iout: 0%
Iout: 100%
Ta = 25°C

Max Inrush Current (A)

Brown out time (s)
2.10 Inrush Current Characteristics during line brown outs

Conditions:
- Vin: 200VAC
- Vout: 100%
- Iout: 0%
- Iout: 100%
- Ta = 25°C
2.11 Inrush current waveform

Conditions: Vin: 100V
Vout: 100%
lout: 100%
Ta = 25°C

Z650-1

Switch on phase angle of input AC voltage
$\phi=0^\circ$

Switch on phase angle of input AC voltage
$\phi=90^\circ$

TDK-Lambda
2.11 Inrush current waveform

Conditions: Vin: 200V
Vout: 100%
lout: 100%
Ta = 25°C

Switch on phase angle of input AC voltage
\( \Phi = 0^\circ \)

Switch on phase angle of input AC voltage
\( \Phi = 90^\circ \)
2.12 Input current waveform

Conditions:
Vin: 100VAC
Vout: 100%
lout: 100%
Ta = 25°C

---

Conditions:
Vin: 200VAC
Vout: 100%
lout: 100%
Ta = 25°C
2.13 Leakage current characteristics

Conditions: Vin: 100~265Vac
Iout: 0%
Iout: 100%
Ta = 25°C
f=50HZ
2.14 Output voltage ripple & noise waveform

C.V mode

Normal Mode

Conditions: Vin: 100 VAC
Vout: 100%
Iout: 100%
Ta = 25°C

Z160-4

Z650-1

TDK-Lambda