

# ***GSP 15kW***

## ***EVALUATION***

### ***DATA***

| DWG: IA852-53-01  |                   |                         |
|-------------------|-------------------|-------------------------|
| APPD              | CHK               | DWG                     |
| Yahiv<br>19/11/18 | Yahiv<br>19/11/18 | M. BHAEEL<br>19.11.2018 |

**TDK-LAMBDA**

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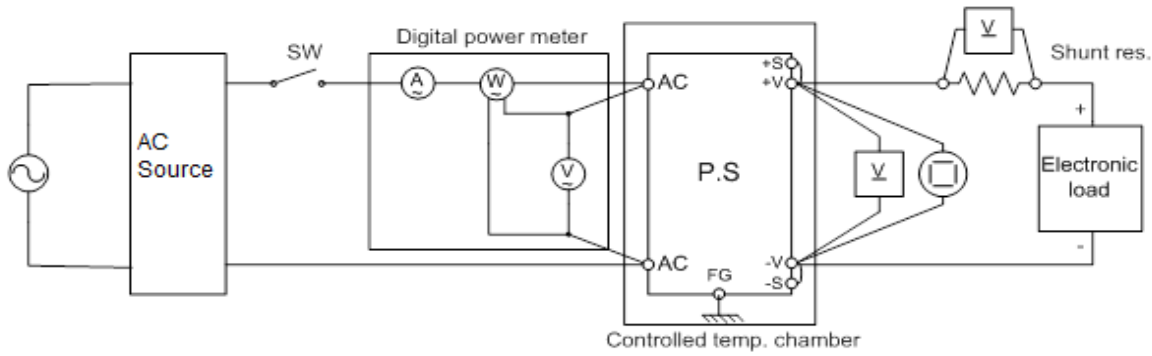
**TERMINOLOGY USED****Definition**

|           |                       |
|-----------|-----------------------|
| $V_{in}$  | Input voltage         |
| $V_{out}$ | Output voltage        |
| $I_{in}$  | Input current         |
| $I_{out}$ | Output current        |
| $T_a$     | Ambient temperature   |
| C.V       | Constant voltage mode |
| C.C       | Constant current mode |

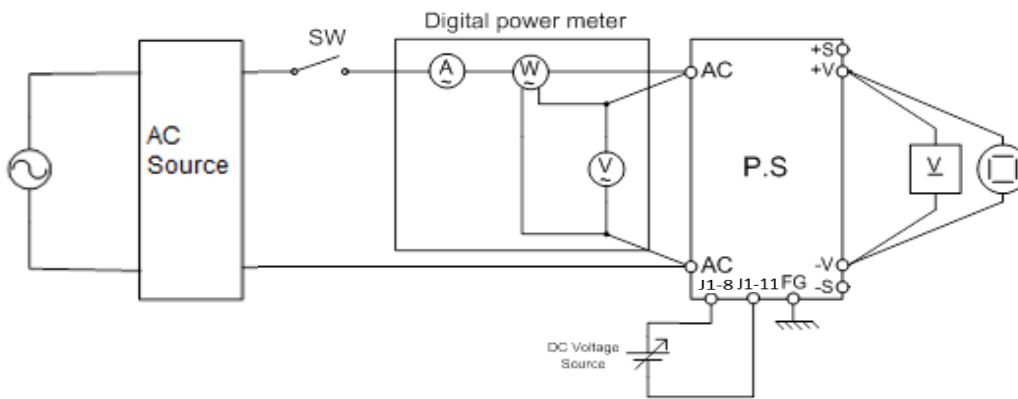
# 1. EVALUATION METHOD

## 1.1 Circuit used for determination

(1) Steady state data

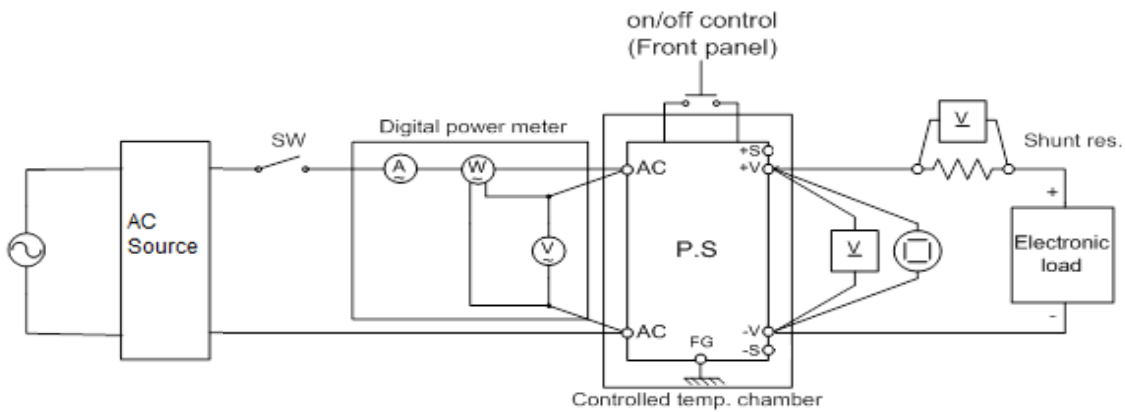


(2) Over voltage protection (OVP) characteristics

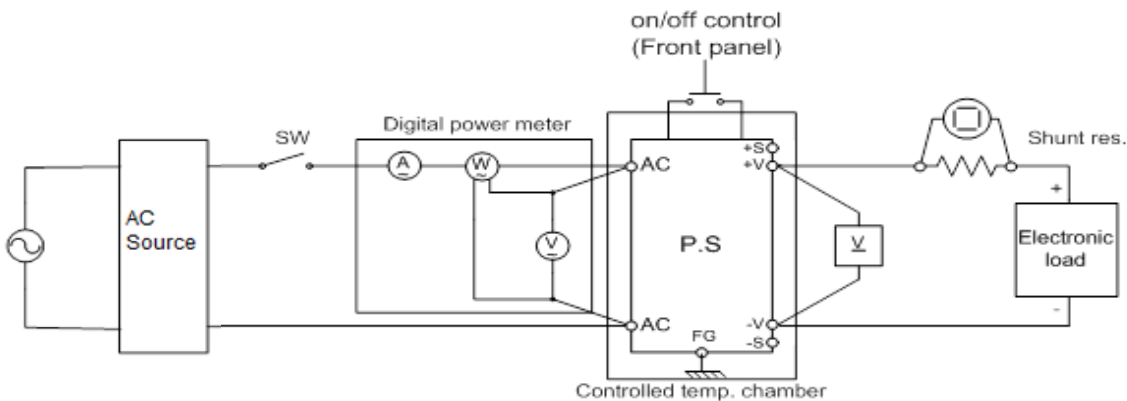


(3) Output rise/fall characteristics

Constant Voltage mode

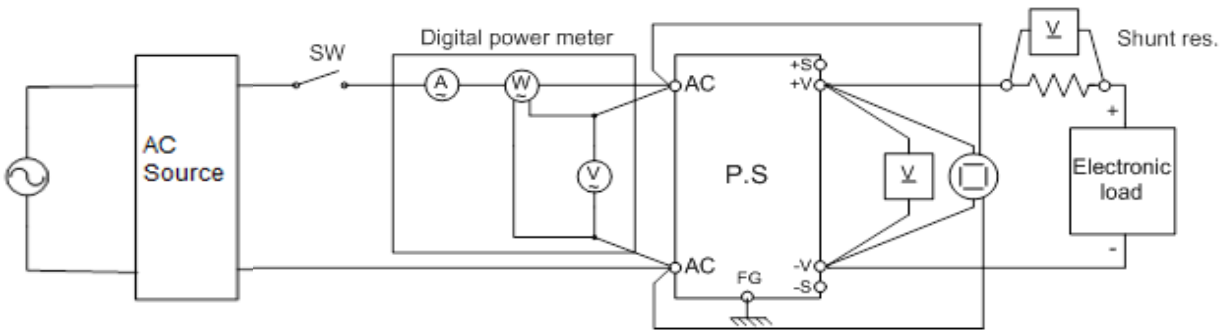


Constant Current mode

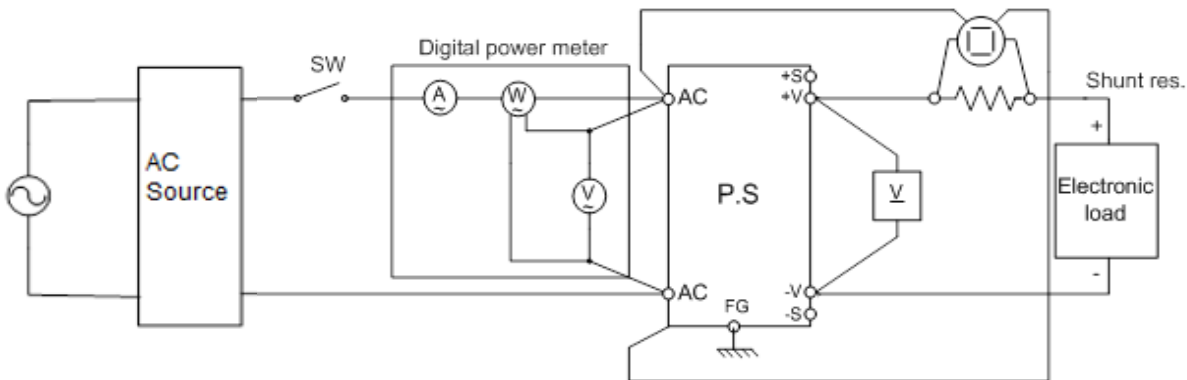


(4) Dynamic line response characteristics

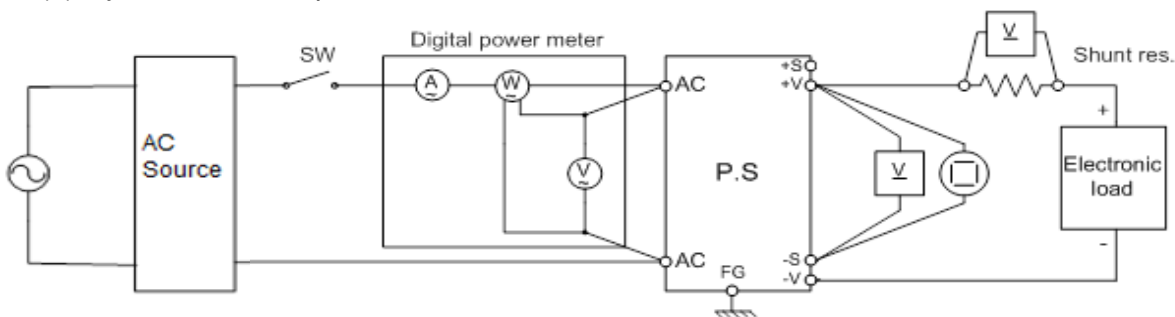
Constant Voltage mode



Constant Current mode

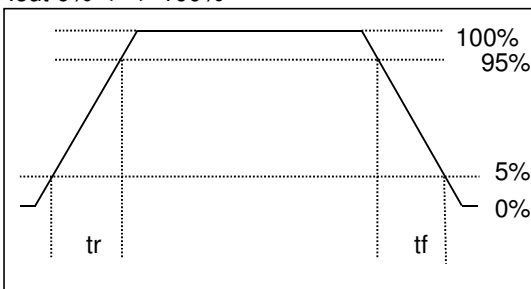


(5) Dynamic load response characteristics



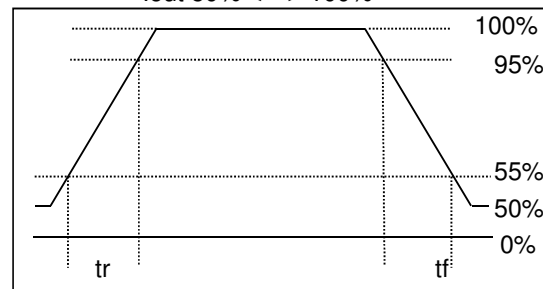
Output current waveform

lout 0% <---> 100%

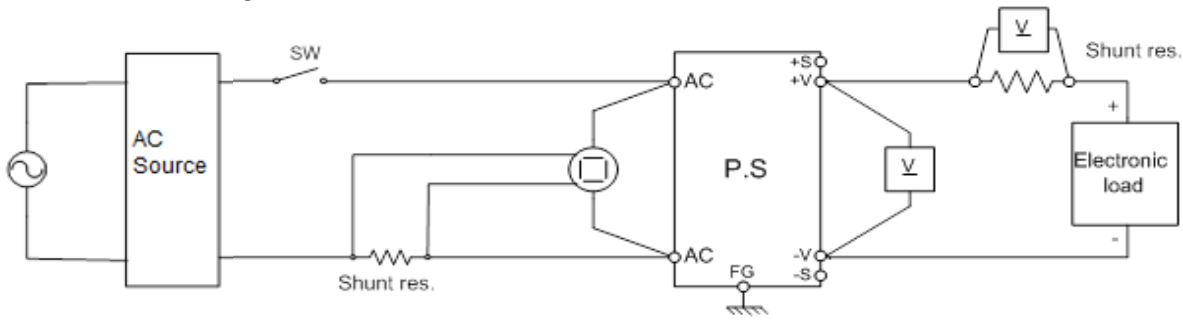


Output current waveform

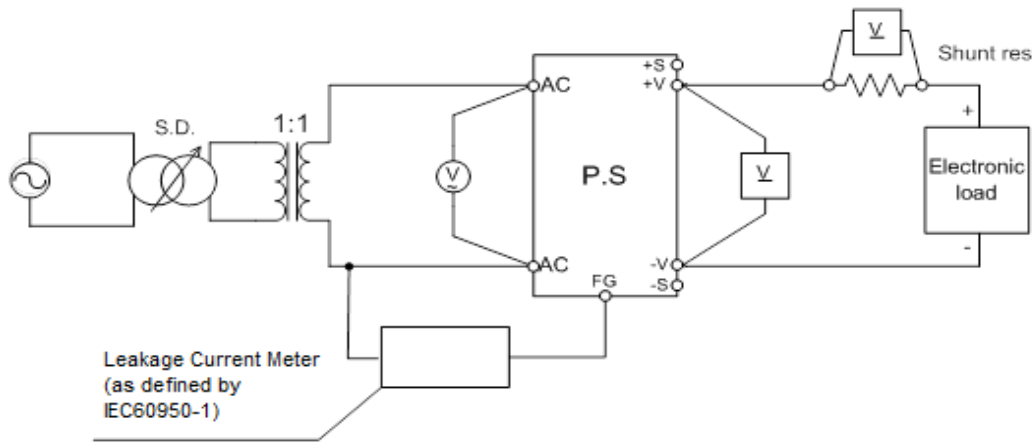
lout 50% <---> 100%



Constant Voltage mode



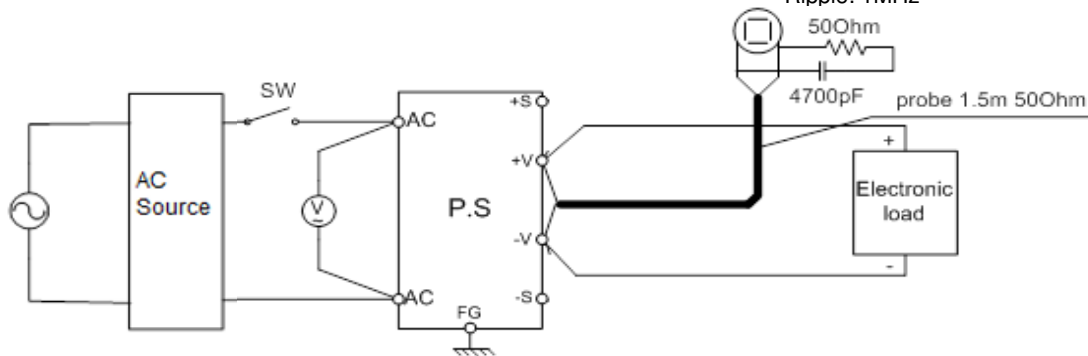
(7) Leakage current characteristics



(8) Output ripple & noise waveform (10V to 300V models)

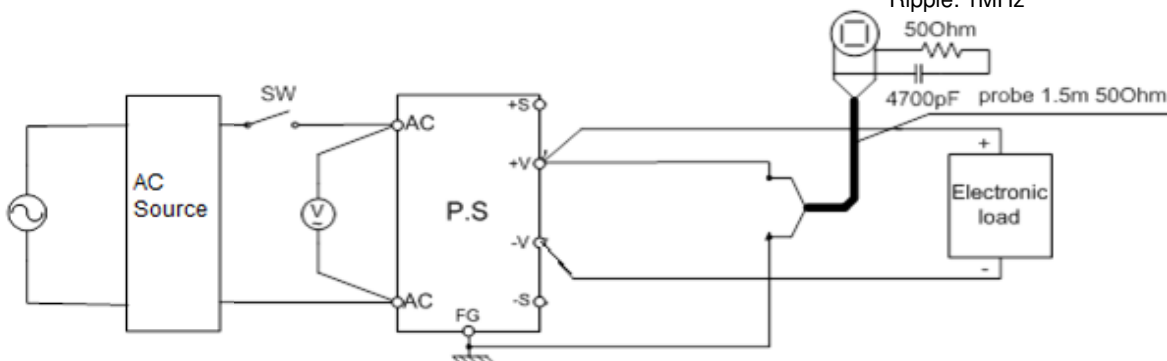
(a) Normal mode (JEITA Standard RC-9131A)

Oscilloscope  
Noise:20MHz  
Ripple: 1MHz



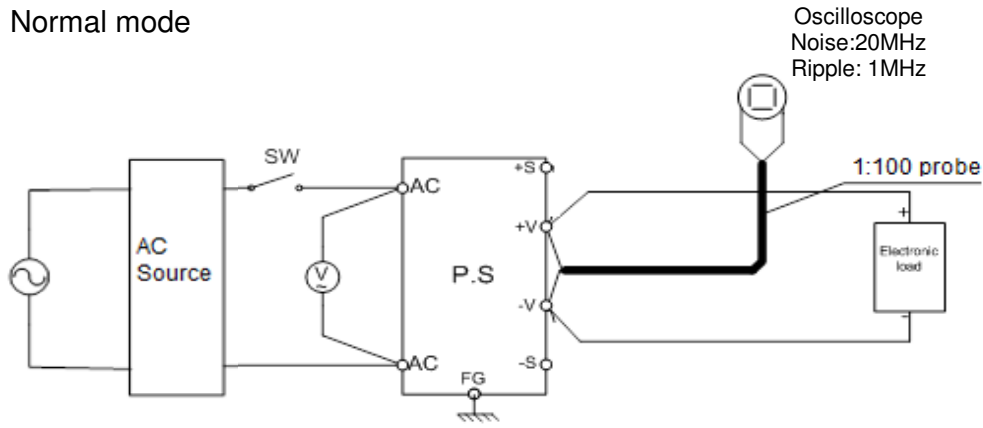
(b) Normal + Common mode

Oscilloscope  
Noise:20MHz  
Ripple: 1MHz

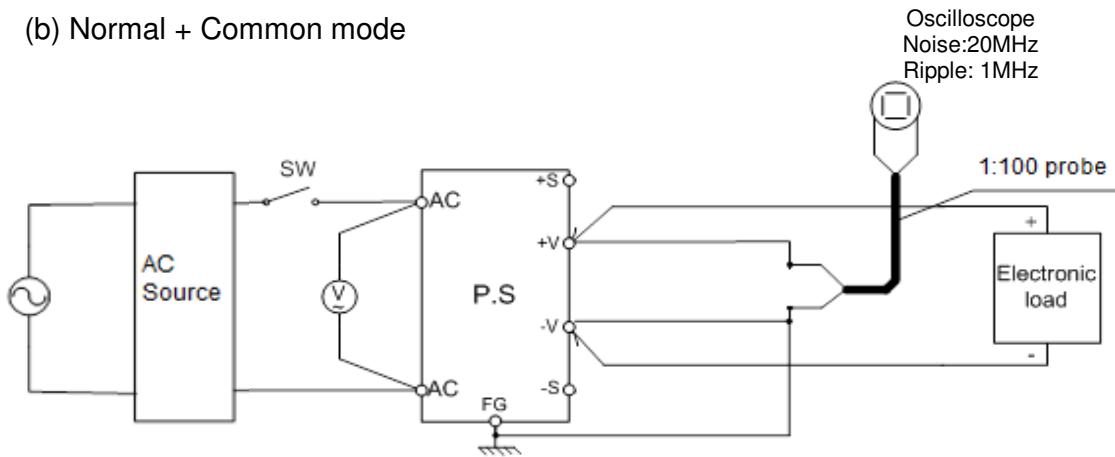


(9) Output ripple & noise waveform (400V to 600V models)

(a) Normal mode



(b) Normal + Common mode



## 1.2 List of equipment used

|    | EQUIPMENT USED           | MANUFACTURER | MODEL No.  |
|----|--------------------------|--------------|------------|
| 1  | Storage oscilloscope     | YOKOGAWA     | DLM2034    |
| 2  | Storage oscilloscope     | YOKOGAWA     | DL1740     |
| 3  | Digital multimeter       | AGILENT      | 34401A     |
| 4  | Digital power meter      | YOKOGAWA     | WT230      |
| 5  | Digital power meter      | YOKOGAWA     | WT330      |
| 6  | Digital power meter      | YOKOGAWA     | WT333E     |
| 7  | Digital power meter      | CHROMA       | 66203      |
| 8  | AC Source                | CHROMA       | 61512      |
| 9  | Variable Transformer     | STAGO ENERGY | 6020E-6Y   |
| 10 | Electronic load          | H&H          | ZS6060     |
| 11 | Electronic load          | H&H          | ZS7006     |
| 12 | Electronic load          | H&H          | ZS7060     |
| 13 | Electronic load          | H&H          | ZS8006     |
| 14 | Electronic load          | CHROMA       | 63203      |
| 15 | Electronic load          | CHROMA       | 63204      |
| 16 | Electronic load          | CHROMA       | 63206A     |
| 17 | Controlled temp. chamber | THERMOTRON   | SM-16-3800 |
| 18 | Controlled temp. chamber | THERMOTRON   | SE-600-5-5 |
| 19 | Controlled temp. chamber | THERMOTRON   | SE-600-6-6 |
| 20 | Leakage current tester   | KIKUSUI      | TOS3200    |
| 21 | Current probe            | YOKOGAWA     | 701931     |
| 22 | Transducer               | LEM          | IT700-SB   |
| 23 | Transducer               | LEM          | IT60-S     |
| 24 | Current Measure          | LEM          | IN 2000-S  |

## (1). Regulation - Line &amp; Load.

GSP10-1500

Conditions: Ta = 25°C

## 1. Regulation - Line &amp; Load, C.V mode 3Φ200

| Io         | Vin    |        |        |        | Line Regulation |        |
|------------|--------|--------|--------|--------|-----------------|--------|
|            | 170VAC | 200VAC | 208VAC | 265VAC |                 |        |
| 0%         | 9.9999 | 9.9999 | 9.9999 | 9.9999 | 0.0             | 0.000% |
| 25%        | 9.9997 | 9.9997 | 9.9997 | 9.9997 | 0.0             | 0.000% |
| 50%        | 9.9996 | 9.9996 | 9.9997 | 9.9997 | 0.1             | 0.001% |
| 75%        | 9.9994 | 9.9994 | 9.9994 | 9.9994 | 0.0             | 0.000% |
| 100%       | 9.9992 | 9.9992 | 9.9992 | 9.9992 | 0.0             | 0.000% |
| Load       | 0.7    | 0.7    | 0.7    | 0.7    | $\Delta V(mV)$  |        |
| Regulation | 0.007% | 0.007% | 0.007% | 0.007% |                 |        |

## 2. Regulation - Line &amp; Load, C.V mode 3Φ400/3Φ480

| Io         | Vin     |         |         |         |         |         | Line Regulation |        |
|------------|---------|---------|---------|---------|---------|---------|-----------------|--------|
|            | 342VAC  | 380VAC  | 400VAC  | 460VAC  | 480VAC  | 520VAC  |                 |        |
| 0%         | 10.0007 | 10.0007 | 10.0007 | 10.0007 | 10.0007 | 10.0007 | 0.0             | 0.000% |
| 25%        | 10.0006 | 10.0006 | 10.0006 | 10.0005 | 10.0006 | 10.0005 | 0.1             | 0.001% |
| 50%        | 10.0005 | 10.0005 | 10.0005 | 10.0005 | 10.0005 | 10.0005 | 0.0             | 0.000% |
| 75%        | 10.0002 | 10.0002 | 10.0002 | 10.0002 | 10.0002 | 10.0002 | 0.0             | 0.000% |
| 80%        | 10.0002 | 10.0002 | 10.0002 | 10.0002 | 10.0002 | 10.0002 | 0.0             | 0.000% |
| Load       | 0.5     | 0.5     | 0.5     | 0.5     | 0.5     | 0.5     | $\Delta V(mV)$  |        |
| Regulation | 0.005%  | 0.005%  | 0.005%  | 0.005%  | 0.005%  | 0.005%  |                 |        |



## (1). Regulation - Line &amp; Load, Temperature drift

GSP60-255

Conditions: Ta = 25 °C

## 1. Regulation - Line &amp; Load, C.V mode 3Φ200

| Io         | Vin     |         |         |         | Line Regulation |        |
|------------|---------|---------|---------|---------|-----------------|--------|
|            | 170VAC  | 200VAC  | 208VAC  | 265VAC  |                 |        |
| 0%         | 60.0007 | 60.0006 | 60.0005 | 60.0005 | 0.2             | 0.000% |
| 25%        | 60.0000 | 60.0002 | 60.0000 | 60.0004 | 0.4             | 0.001% |
| 50%        | 59.9995 | 59.9997 | 59.9998 | 59.9998 | 0.3             | 0.001% |
| 75%        | 59.9995 | 59.9995 | 59.9995 | 59.9996 | 0.1             | 0.000% |
| 100%       | 59.9989 | 59.9992 | 59.9992 | 59.9991 | 0.3             | 0.001% |
| Load       | 1.8     | 1.4     | 1.3     | 1.4     | ΔV(mV)          |        |
| Regulation | 0.003%  | 0.002%  | 0.002%  | 0.002%  |                 |        |

## 2. Regulation - Line &amp; Load, C.V mode 3Φ400/3Φ480

| Io         | Vin     |         |         |         |         |         | Line Regulation |        |
|------------|---------|---------|---------|---------|---------|---------|-----------------|--------|
|            | 342VAC  | 380VAC  | 400VAC  | 460VAC  | 480VAC  | 520VAC  |                 |        |
| 0%         | 59.9991 | 59.9992 | 59.9993 | 59.9991 | 60.0002 | 60.0001 | 1.1             | 0.002% |
| 25%        | 59.9985 | 59.9985 | 59.9985 | 59.9985 | 59.9996 | 59.9995 | 1.1             | 0.002% |
| 50%        | 59.9980 | 59.9981 | 59.9982 | 59.9982 | 59.9990 | 59.9991 | 1.1             | 0.002% |
| 75%        | 59.9978 | 59.9979 | 59.9979 | 59.9980 | 59.9986 | 59.9986 | 0.8             | 0.001% |
| 80%        | 59.9978 | 59.9975 | 59.9974 | 59.9974 | 59.9980 | 59.9982 | 0.8             | 0.001% |
| Load       | 1.3     | 1.7     | 1.9     | 1.7     | 2.2     | 1.9     | ΔV(mV)          |        |
| Regulation | 0.002%  | 0.003%  | 0.003%  | 0.003%  | 0.004%  | 0.003%  |                 |        |

## 3. Temperature drift, C.V mode

Conditions: Vin:400V 3Φ  
Iout:100%

| Ta   | 0 °C    | 25 °C   | 50 °C   | Temp. Coefficient (0 °C~50 °C) |    |          |
|------|---------|---------|---------|--------------------------------|----|----------|
| Vout | 59.9960 | 59.9976 | 59.9969 | 1.6                            | mV | 1 ppm/°C |

**(1). Regulation - Line & Load, Temperature drift**

GSP150-102

Conditions: Ta = 25°C

1. Regulation - Line & Load, C.V mode 3Φ200

| Io         | Vin      |          |          |          | Line Regulation |        |
|------------|----------|----------|----------|----------|-----------------|--------|
|            | 170VAC   | 200VAC   | 208VAC   | 265VAC   |                 |        |
| 0%         | 149.9930 | 149.9940 | 149.9940 | 149.9940 | 1.0             | 0.001% |
| 25%        | 149.9930 | 149.9932 | 149.9936 | 149.9933 | 0.6             | 0.000% |
| 50%        | 149.9930 | 149.9930 | 149.9935 | 149.9930 | 0.5             | 0.000% |
| 75%        | 149.9933 | 149.9930 | 149.9930 | 149.9937 | 0.7             | 0.000% |
| 100%       | 149.9930 | 149.9934 | 149.9930 | 149.9930 | 0.4             | 0.000% |
| Load       | 0.3      | 1.0      | 1.0      | 1.0      | ΔV(mV)          |        |
| Regulation | 0.000%   | 0.001%   | 0.001%   | 0.001%   |                 |        |

2. Regulation - Line & Load, C.V mode 3Φ400/3Φ480

| Io         | Vin      |          |          |          |          |          | Line Regulation |        |
|------------|----------|----------|----------|----------|----------|----------|-----------------|--------|
|            | 342VAC   | 380VAC   | 400VAC   | 460VAC   | 480VAC   | 520VAC   |                 |        |
| 0%         | 150.0030 | 150.0040 | 150.0040 | 150.0040 | 150.0040 | 150.0040 | 1.0             | 0.001% |
| 25%        | 150.0030 | 150.0030 | 150.0030 | 150.0030 | 150.0030 | 150.0030 | 0.0             | 0.000% |
| 50%        | 150.0030 | 150.0030 | 150.0030 | 150.0030 | 150.0030 | 150.0030 | 0.0             | 0.000% |
| 75%        | 150.0020 | 150.0020 | 150.0020 | 150.0020 | 150.0020 | 150.0020 | 0.0             | 0.000% |
| 100%       | 150.0010 | 150.0010 | 150.0010 | 150.0010 | 150.0010 | 150.0010 | 0.0             | 0.000% |
| Load       | 2.0      | 3.0      | 3.0      | 3.0      | 3.0      | 3.0      | ΔV(mV)          |        |
| Regulation | 0.001%   | 0.002%   | 0.002%   | 0.002%   | 0.002%   | 0.002%   |                 |        |

3. Temperature drift, C.V mode

Conditions: Vin:480V 3Φ  
Iout:100%

| Ta   | 0°C      | 25°C     | 50°C     | Temp. Coefficient (0°C~50°C) |    |          |
|------|----------|----------|----------|------------------------------|----|----------|
| Vout | 149.9980 | 149.9850 | 149.9570 | 41                           | mV | 5 ppm/°C |

## (1). Regulation - Line &amp; Load.

GSP600-25.5

Conditions: Ta = 25 °C

## 1. Regulation - Line &amp; Load, C.V mode 3Φ200

| Io         | Vin      |          |          |          | Line Regulation |        |
|------------|----------|----------|----------|----------|-----------------|--------|
|            | 170VAC   | 200VAC   | 208VAC   | 265VAC   |                 |        |
| 0%         | 599.9297 | 599.9304 | 599.9311 | 599.9326 | 2.8             | 0.000% |
| 25%        | 599.9355 | 599.9361 | 599.9361 | 599.9371 | 1.7             | 0.000% |
| 50%        | 599.9410 | 599.9426 | 599.9413 | 599.9424 | 1.6             | 0.000% |
| 75%        | 599.9416 | 599.9420 | 599.9417 | 599.9414 | 0.6             | 0.000% |
| 100%       | 599.9428 | 599.9428 | 599.9429 | 599.9431 | 0.3             | 0.000% |
| Load       | 13.1     | 12.4     | 11.7     | 10.5     | ΔV(mV)          |        |
| Regulation | 0.002%   | 0.002%   | 0.002%   | 0.002%   |                 |        |

## 2. Regulation - Line &amp; Load, C.V mode 3Φ400/3Φ480

| Io         | Vin      |          |          |          |          |          | Line Regulation |        |
|------------|----------|----------|----------|----------|----------|----------|-----------------|--------|
|            | 342VAC   | 380VAC   | 400VAC   | 460VAC   | 480VAC   | 520VAC   |                 |        |
| 0%         | 600.0626 | 600.0626 | 600.0641 | 600.0652 | 600.0665 | 600.0860 | 23.4            | 0.004% |
| 25%        | 600.0691 | 600.0686 | 600.0685 | 600.0684 | 600.0683 | 600.0920 | 23.7            | 0.004% |
| 50%        | 600.0741 | 600.0731 | 600.0735 | 600.0730 | 600.0725 | 600.0970 | 24.5            | 0.004% |
| 75%        | 600.0741 | 600.0742 | 600.0739 | 600.0729 | 600.0734 | 600.0980 | 25.1            | 0.004% |
| 100%       | 600.0769 | 600.0766 | 600.0784 | 600.0781 | 600.0787 | 600.0990 | 22.4            | 0.004% |
| Load       | 14.3     | 14.0     | 14.3     | 12.9     | 12.2     | 13.0     | ΔV(mV)          |        |
| Regulation | 0.002%   | 0.002%   | 0.002%   | 0.002%   | 0.002%   | 0.002%   |                 |        |

**(1). Regulation - Line & Load.**

GSP10-1500

Conditions: Ta = 25°C

1. Regulation - Line & Load, C.C mode 3Φ200 (\*)

| Vo         | Vin      |          |          |          | Line Regulation |        |
|------------|----------|----------|----------|----------|-----------------|--------|
|            | 170VAC   | 200VAC   | 208VAC   | 265VAC   |                 |        |
| 0%         | 1499.688 | 1499.688 | 1499.688 | 1499.692 | 4.0             | 0.000% |
| 25%        | 1499.674 | 1499.670 | 1499.672 | 1499.670 | 4.0             | 0.000% |
| 50%        | 1499.660 | 1499.662 | 1499.662 | 1499.670 | 10.0            | 0.001% |
| 75%        | 1499.678 | 1499.680 | 1499.690 | 1499.690 | 12.0            | 0.001% |
| 100%       | 1499.646 | 1499.648 | 1499.646 | 1499.646 | 2.0             | 0.000% |
| Load       | 42.0     | 40.0     | 44.0     | 46.0     | ΔI(mA)          |        |
| Regulation | 0.003%   | 0.003%   | 0.003%   | 0.003%   |                 |        |

2. Regulation - Line & Load, C.C mode 3Φ400/3Φ480 (\*)

| Io         | Vin       |           |           |           |           |           | Line Regulation |        |
|------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------------|--------|
|            | 342VAC    | 380VAC    | 400VAC    | 460VAC    | 480VAC    | 520VAC    |                 |        |
| 0%         | 1199.9600 | 1199.9600 | 1199.9600 | 1199.9600 | 1199.9600 | 1199.9600 | 0.0             | 0.000% |
| 25%        | 1199.9400 | 1199.9400 | 1199.9400 | 1199.9400 | 1199.9400 | 1199.9400 | 0.0             | 0.000% |
| 50%        | 1199.9400 | 1199.9400 | 1199.9200 | 1199.9200 | 1199.9400 | 1199.9400 | 20.0            | 0.002% |
| 75%        | 1199.9600 | 1199.9660 | 1199.9700 | 1199.9600 | 1199.9400 | 1199.9600 | 30.0            | 0.002% |
| 80%        | 1199.9600 | 1199.9600 | 1199.9600 | 1199.9400 | 1199.9400 | 1199.9400 | 20.0            | 0.002% |
| Load       | 20.0      | 26.0      | 50.0      | 40.0      | 20.0      | 20.0      | ΔI(mA)          |        |
| Regulation | 0.002%    | 0.002%    | 0.004%    | 0.003%    | 0.002%    | 0.002%    |                 |        |

2. Regulation - Line & Load, C.C mode 3Φ400/3Φ480 (\*)

| Io         | Vin       |           |           |           | Line Regulation |        |
|------------|-----------|-----------|-----------|-----------|-----------------|--------|
|            | 420VAC    | 460VAC    | 480VAC    | 520VAC    |                 |        |
| 0%         | 1499.6800 | 1499.6800 | 1499.6920 | 1499.7000 | 20.0            | 0.001% |
| 25%        | 1499.6600 | 1499.6600 | 1499.6400 | 1499.6400 | 20.0            | 0.001% |
| 50%        | 1499.6400 | 1499.6600 | 1499.6600 | 1499.6600 | 20.0            | 0.001% |
| 75%        | 1499.6600 | 1499.6600 | 1499.6600 | 1499.6600 | 0.0             | 0.000% |
| 100%       | 1499.6800 | 1499.6800 | 1499.6600 | 1499.6600 | 20.0            | 0.001% |
| Load       | 40.0      | 20.0      | 52.0      | 60.0      | ΔI(mA)          |        |
| Regulation | 0.003%    | 0.001%    | 0.003%    | 0.004%    |                 |        |

**(1). Regulation - Line & Load, Temperature drift**

GSP60-255

Conditions: Ta = 25°C

1. Regulation - Line & Load, C.C mode 3Φ200 (\*)

| Vo         | Vin      |          |          |          | Line Regulation |        |
|------------|----------|----------|----------|----------|-----------------|--------|
|            | 170VAC   | 200VAC   | 208VAC   | 265VAC   |                 |        |
| 0%         | 254.8912 | 254.8909 | 254.8892 | 254.8874 | 3.8             | 0.001% |
| 25%        | 254.8885 | 254.8872 | 254.8856 | 254.8848 | 3.7             | 0.001% |
| 50%        | 254.8877 | 254.8876 | 254.8867 | 254.8875 | 1.0             | 0.000% |
| 75%        | 254.8900 | 254.8899 | 254.8906 | 254.8905 | 0.7             | 0.000% |
| 100%       | 254.8885 | 254.8881 | 254.8883 | 254.8888 | 0.7             | 0.000% |
| Load       | 3.5      | 3.7      | 5.0      | 5.7      | ΔI(mA)          |        |
| Regulation | 0.001%   | 0.001%   | 0.002%   | 0.002%   |                 |        |

2. Regulation - Line & Load, C.C mode 3Φ400/3Φ480 (\*)

| Io         | Vin      |          |          |          |          |          | Line Regulation |        |
|------------|----------|----------|----------|----------|----------|----------|-----------------|--------|
|            | 342VAC   | 380VAC   | 400VAC   | 460VAC   | 480VAC   | 520VAC   |                 |        |
| 0%         | 254.9158 | 254.9118 | 254.9076 | 254.9040 | 254.9159 | 254.9126 | 11.9            | 0.005% |
| 25%        | 254.9020 | 254.8986 | 254.8966 | 254.8946 | 254.9008 | 254.9088 | 14.2            | 0.006% |
| 50%        | 254.8954 | 254.8943 | 254.8930 | 254.8928 | 254.9011 | 254.9069 | 14.1            | 0.006% |
| 75%        | 254.8947 | 254.8950 | 254.8954 | 254.8960 | 254.9084 | 254.9069 | 13.7            | 0.005% |
| 80%        | 254.8928 | 254.8936 | 254.8945 | 254.8962 | 254.9009 | 254.8997 | 8.1             | 0.003% |
| Load       | 23.0     | 18.2     | 14.6     | 11.2     | 15.1     | 12.9     | ΔI(mA)          |        |
| Regulation | 0.009%   | 0.007%   | 0.006%   | 0.004%   | 0.006%   | 0.005%   |                 |        |

3. Temperature drift, C.C mode

Conditions:

Vin:400V 3Φ  
Iout:100%

| Ta   | 0°C      | 25°C     | 50°C     | Temp. Coefficient (0°C~50°C) |           |
|------|----------|----------|----------|------------------------------|-----------|
| Iout | 254.9946 | 255.0779 | 255.2949 | 300 mA                       | 24 ppm/°C |

Notes:

(\*) Not including load regulation thermal drift effect.

**(1). Regulation - Line & Load, Temperature drift**

GSP150-102

Conditions: Ta = 25°C

1. Regulation - Line & Load, C.C mode 3Φ200 (\*)

| Vo         | Vin      |          |          |          | Line Regulation |        |
|------------|----------|----------|----------|----------|-----------------|--------|
|            | 170VAC   | 200VAC   | 208VAC   | 265VAC   |                 |        |
| 0%         | 102.0243 | 102.0243 | 102.0243 | 102.0250 | 0.7             | 0.001% |
| 25%        | 102.0236 | 102.0243 | 102.0236 | 102.0236 | 0.7             | 0.001% |
| 50%        | 102.0299 | 102.0299 | 102.0299 | 102.0299 | 0.0             | 0.000% |
| 75%        | 102.0313 | 102.0306 | 102.0313 | 102.0306 | 0.7             | 0.001% |
| 100%       | 102.0306 | 102.0306 | 102.0306 | 102.0306 | 0.0             | 0.000% |
| Load       | 7.7      | 6.3      | 7.7      | 7.0      | ΔI(mA)          |        |
| Regulation | 0.008%   | 0.006%   | 0.008%   | 0.007%   |                 |        |

2. Regulation - Line & Load, C.C mode 3Φ400/3Φ480 (\*)

| Io         | Vin      |          |          |          |          |          | Line Regulation |        |
|------------|----------|----------|----------|----------|----------|----------|-----------------|--------|
|            | 342VAC   | 380VAC   | 400VAC   | 460VAC   | 480VAC   | 520VAC   |                 |        |
| 0%         | 102.0285 | 102.0285 | 102.0285 | 102.0285 | 102.0285 | 102.0320 | 3.5             | 0.003% |
| 25%        | 102.0299 | 102.0299 | 102.0299 | 102.0299 | 102.0299 | 102.0320 | 2.1             | 0.002% |
| 50%        | 102.0355 | 102.0355 | 102.0355 | 102.0355 | 102.0355 | 102.0390 | 3.5             | 0.003% |
| 75%        | 102.0355 | 102.0355 | 102.0355 | 102.0362 | 102.0362 | 102.0390 | 3.5             | 0.003% |
| 100%       | 102.0348 | 102.0348 | 102.0348 | 102.0362 | 102.0362 | 102.0376 | 2.8             | 0.003% |
| Load       | 7.0      | 7.0      | 7.0      | 7.7      | 7.7      | 7.0      | ΔI(mA)          |        |
| Regulation | 0.007%   | 0.007%   | 0.007%   | 0.008%   | 0.008%   | 0.007%   |                 |        |

3. Temperature drift, C.C mode

Conditions: Vin:480V 3Φ  
Iout:100%

| Ta   | 0°C      | 25°C     | 50°C     | Temp. Coefficient (0°C~50°C) |           |
|------|----------|----------|----------|------------------------------|-----------|
| Iout | 102.0376 | 102.0656 | 102.1454 | 107.80 mA                    | 21 ppm/°C |

Notes:

(\*) Not including load regulation thermal drift effect.

## (1). Regulation - Line &amp; Load.

GSP600-25.5

Conditions: Ta = 25°C

## 1. Regulation - Line &amp; Load, C.C mode 3Φ200 (\*)

| Vo         | Vin     |         |         |         | Line Regulation |        |
|------------|---------|---------|---------|---------|-----------------|--------|
|            | 170VAC  | 200VAC  | 208VAC  | 265VAC  |                 |        |
| 0%         | 25.4821 | 25.4821 | 25.4821 | 25.4817 | 0.4             | 0.002% |
| 25%        | 25.4811 | 25.4809 | 25.4810 | 25.4811 | 0.2             | 0.001% |
| 50%        | 25.4831 | 25.4832 | 25.4831 | 25.4827 | 0.4             | 0.002% |
| 75%        | 25.4821 | 25.4820 | 25.4819 | 25.4818 | 0.3             | 0.001% |
| 100%       | 25.4825 | 25.4823 | 25.4821 | 25.4819 | 0.6             | 0.002% |
| Load       | 2.0     | 2.3     | 2.1     | 1.6     | ΔI(mA)          |        |
| Regulation | 0.008%  | 0.009%  | 0.008%  | 0.006%  |                 |        |

## 2. Regulation - Line &amp; Load, C.C mode 3Φ400/3Φ480 (\*)

| Io         | Vin     |         |         |         |         |         | Line Regulation |        |
|------------|---------|---------|---------|---------|---------|---------|-----------------|--------|
|            | 342VAC  | 380VAC  | 400VAC  | 460VAC  | 480VAC  | 520VAC  |                 |        |
| 0%         | 25.4751 | 25.4747 | 25.4746 | 25.4743 | 25.4741 | 25.4721 | 3.0             | 0.012% |
| 25%        | 25.4737 | 25.4739 | 25.4740 | 25.4742 | 25.4744 | 25.4724 | 2.0             | 0.008% |
| 50%        | 25.4748 | 25.4747 | 25.4748 | 25.4746 | 25.4745 | 25.4725 | 2.3             | 0.009% |
| 75%        | 25.4736 | 25.4738 | 25.4738 | 25.4740 | 25.4741 | 25.4721 | 2.0             | 0.008% |
| 100%       | 25.4738 | 25.4738 | 25.4740 | 25.4739 | 25.4740 | 25.4741 | 0.3             | 0.001% |
| Load       | 1.5     | 0.9     | 1.0     | 0.7     | 0.5     | 2.0     | ΔI(mA)          |        |
| Regulation | 0.006%  | 0.004%  | 0.004%  | 0.003%  | 0.002%  | 0.008%  |                 |        |

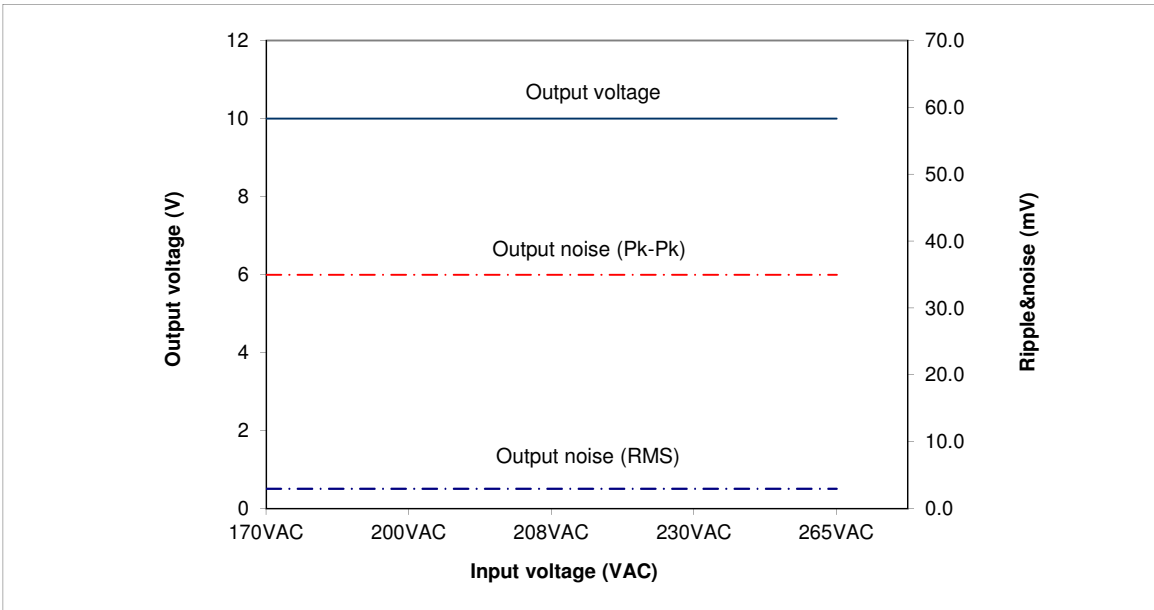
(2). Output voltage and ripple voltage vs. input voltage

C.V mode

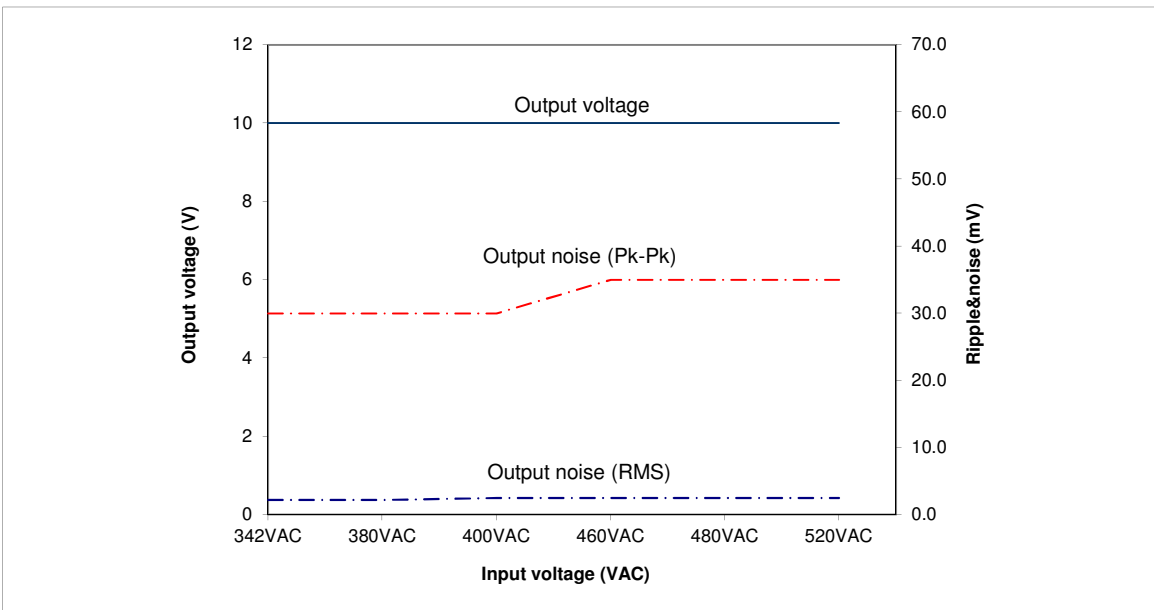
Conditions: Iout:100%

Ta: 25°C

GSP10-1500 3Φ200



GSP10-1500 3Φ400/3Φ480





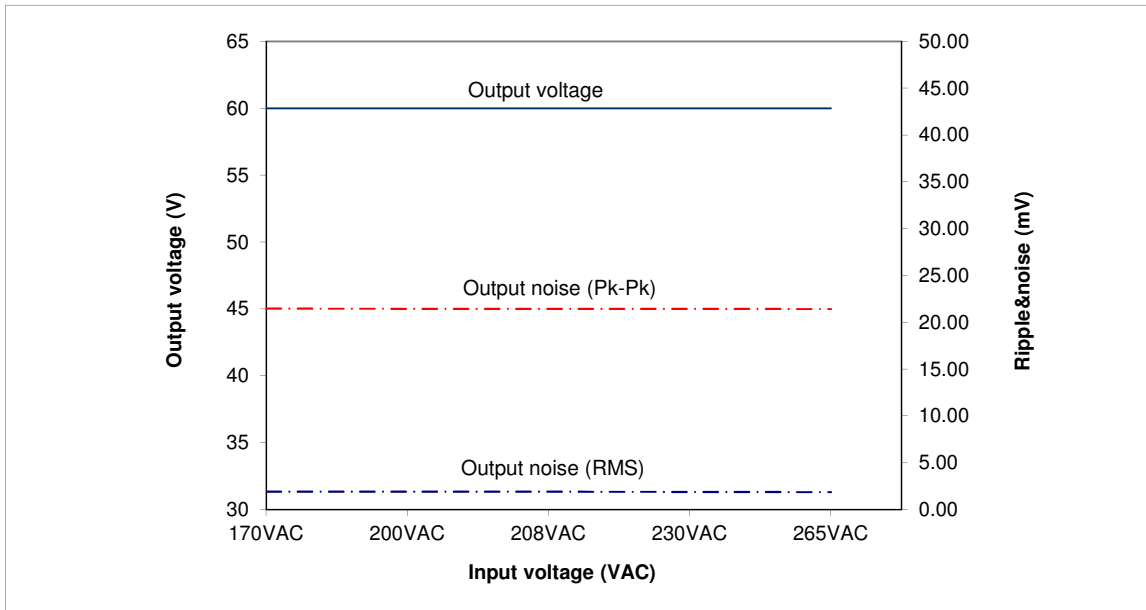
(2). Output voltage and ripple voltage vs. input voltage

C.V mode

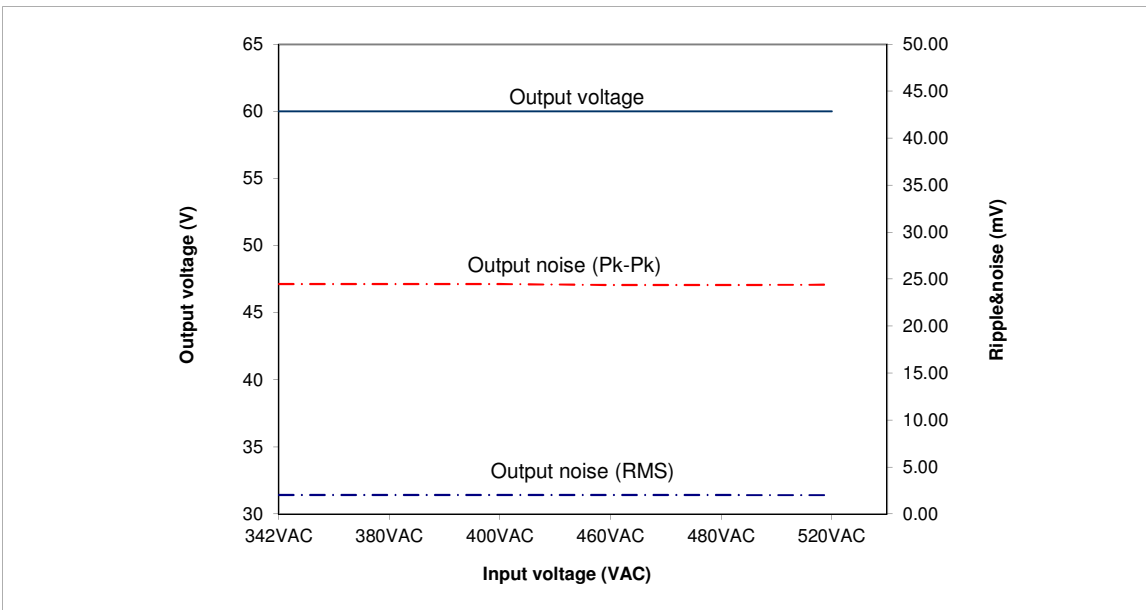
Conditions: Iout:100%

Ta: 25°C

GSP60-255 3Φ200



GSP60-255 3Φ400/3Φ480

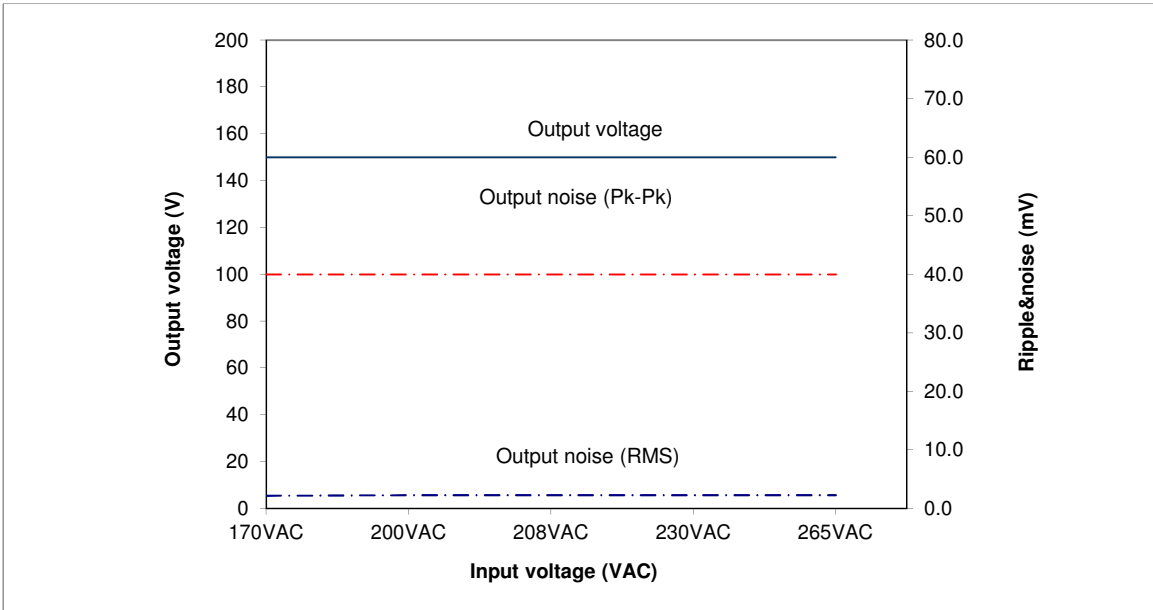


(2). Output voltage and ripple voltage vs. input voltage  
C.V mode

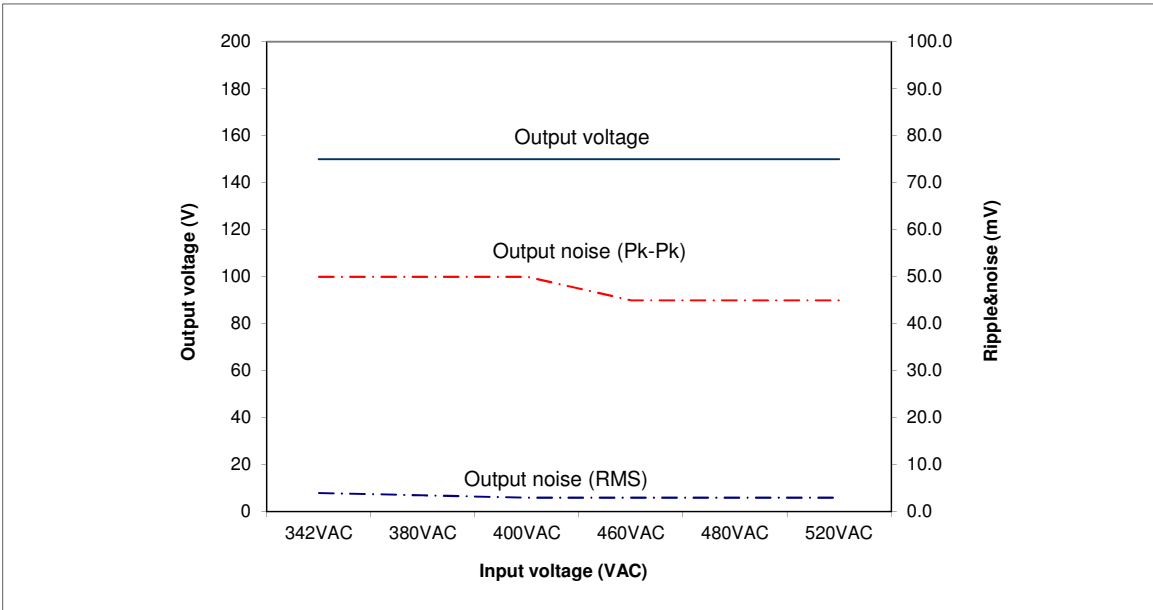
Conditions: Iout:100%

Ta: 25°C

GSP150-102 3Φ200



GSP150-102 3Φ400/3Φ480



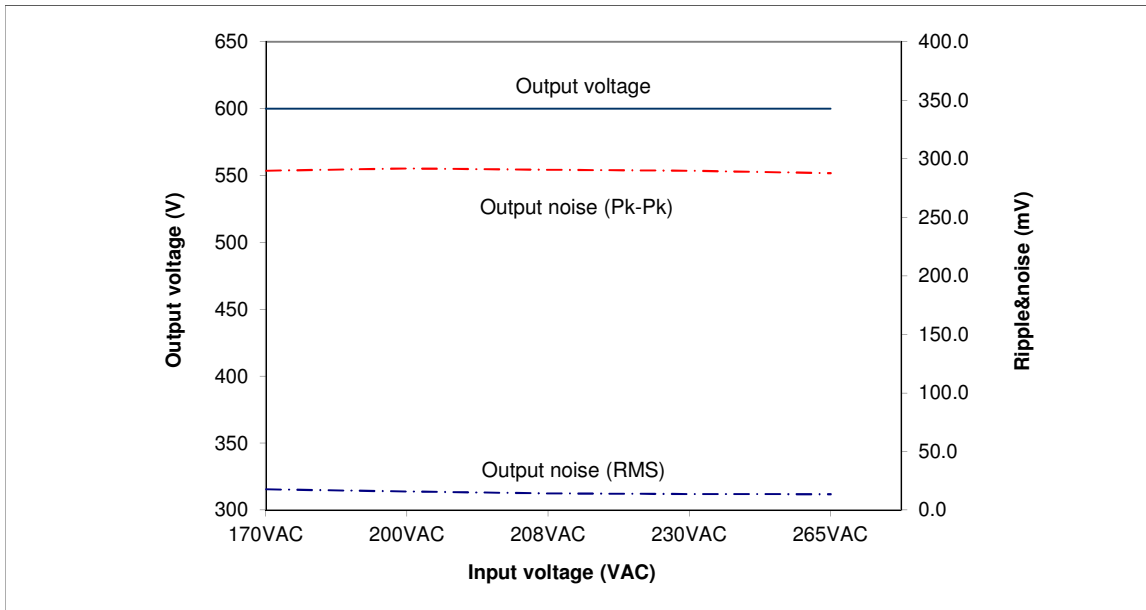
(2). Output voltage and ripple voltage vs. input voltage

C.V mode

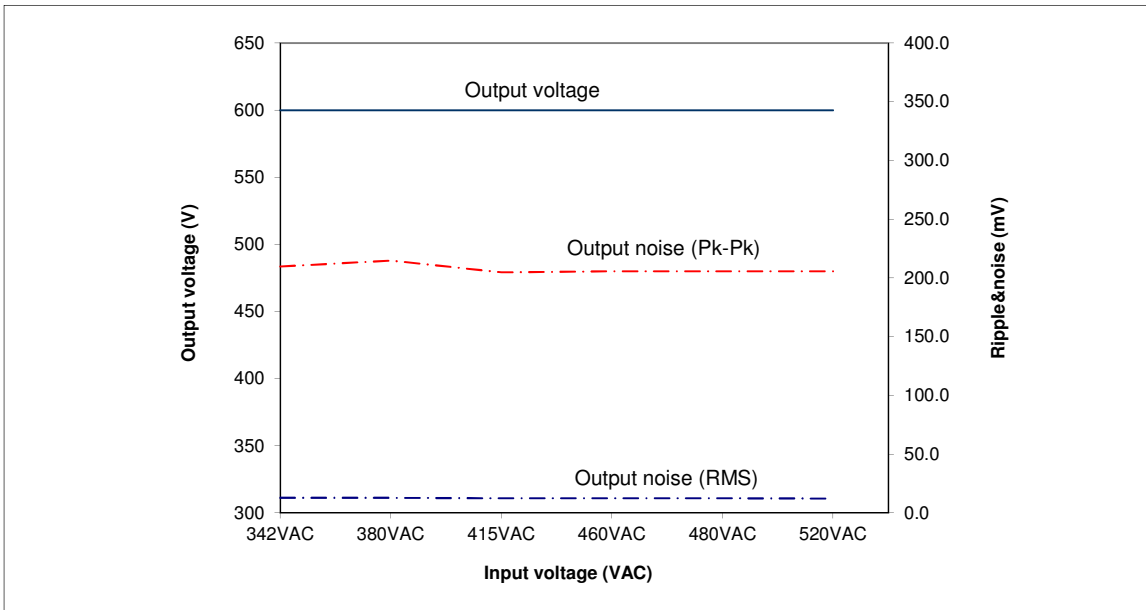
Conditions: Iout:100%

Ta: 25°C

GSP600-25.5 3Φ200



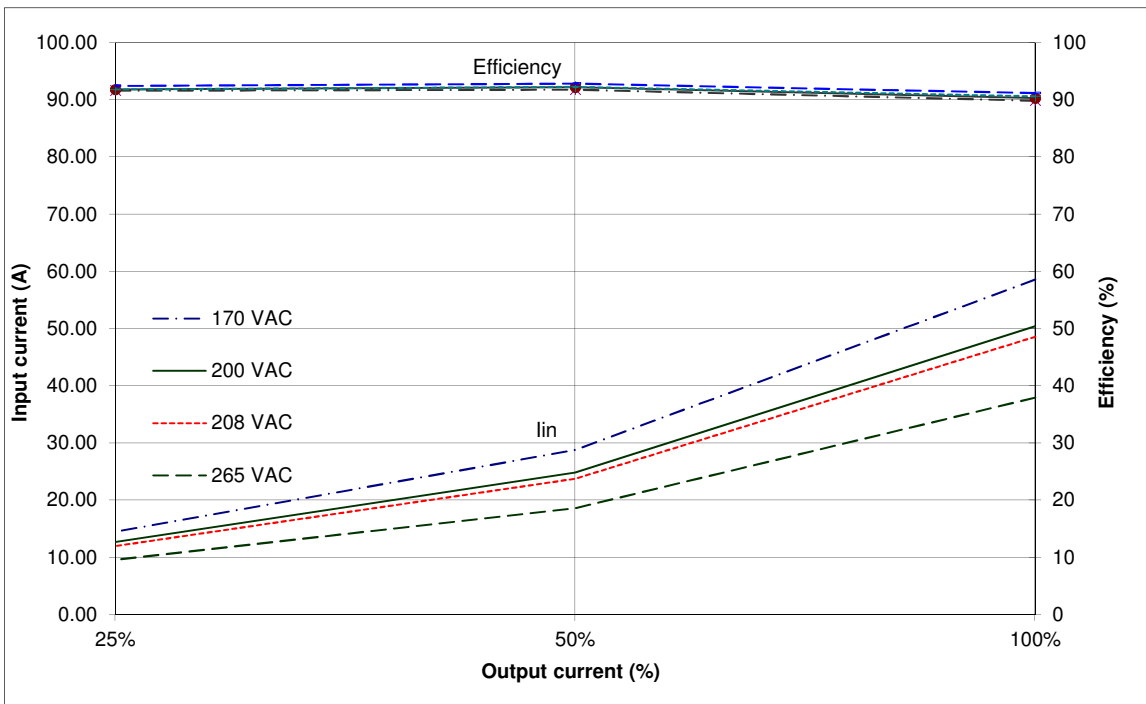
GSP600-25.5 3Φ400/3Φ480



(3). Efficiency and Input current vs. Output current

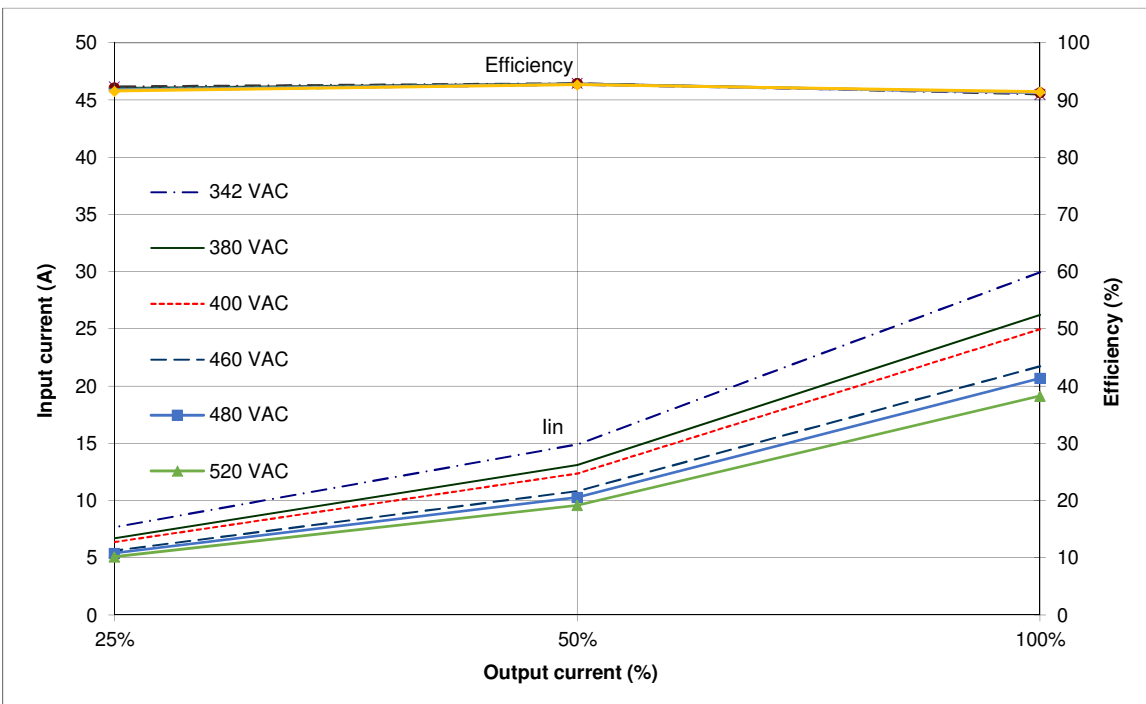
GSP10-1500 3Φ200

Conditions:  
 Vin: 170~265 VAC  
 Vout: 100%  
 Ta: 25°C



GSP10-1500 3Φ400/3Φ480

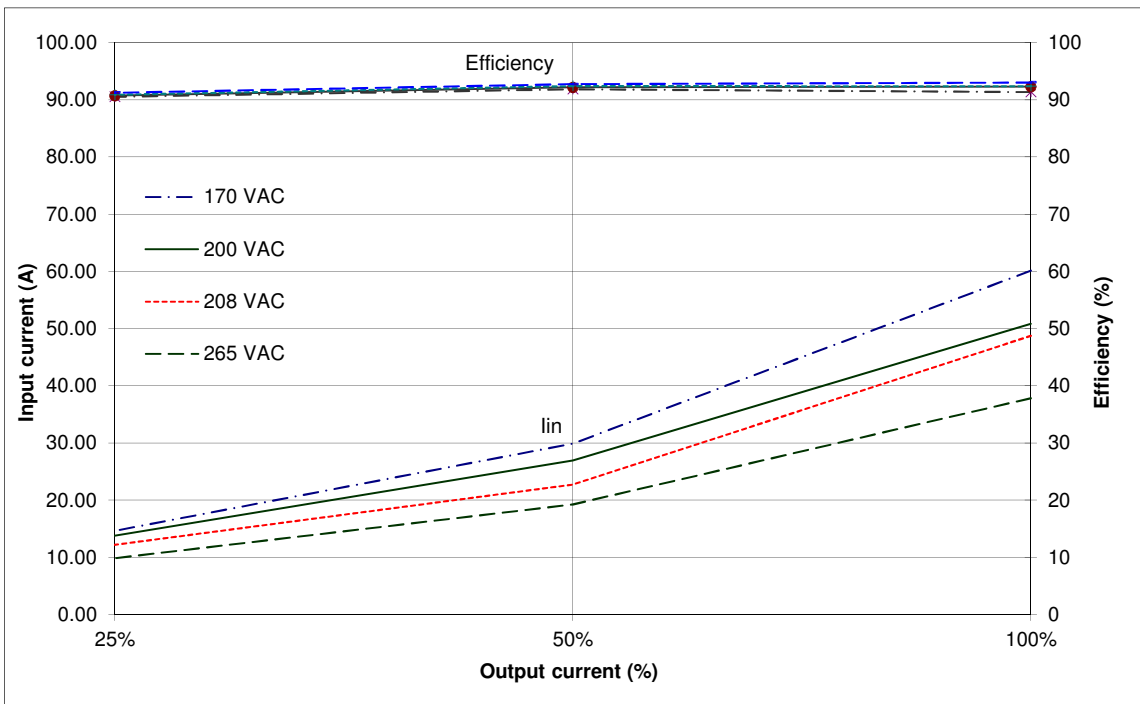
Conditions:  
 Vin: 342~520 VAC  
 Vout: 100%  
 Ta: 25°C



(3). Efficiency and Input current vs. Output current

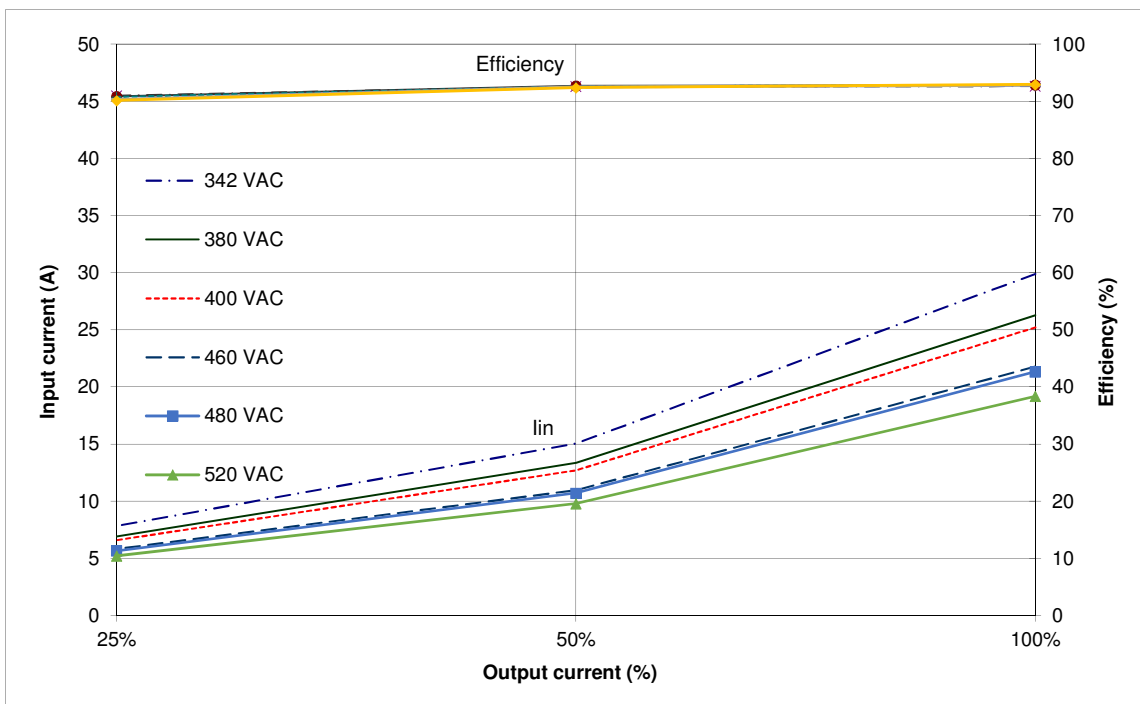
GSP60-255 3Φ200

Conditions:  
 Vin: 170~265 VAC  
 Vout: 100%  
 Ta: 25°C



GSP60-255 3Φ400/3Φ480

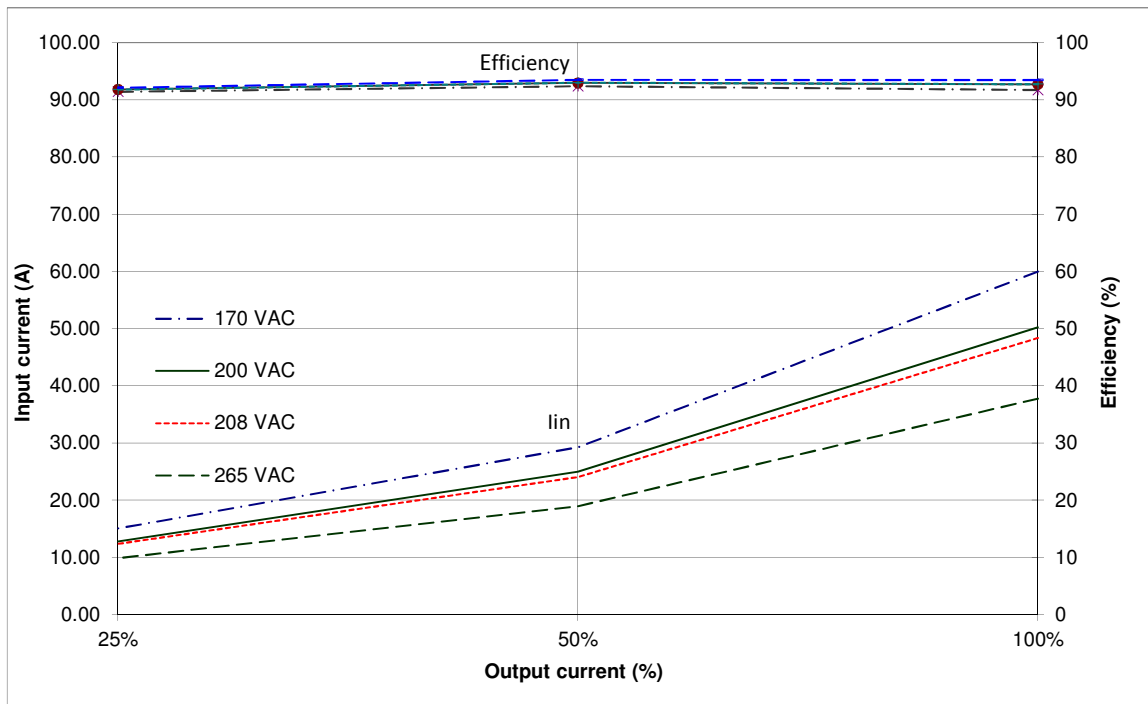
Conditions:  
 Vin: 342~520 VAC  
 Vout: 100%  
 Ta: 25°C



(3). Efficiency and Input current vs. Output current

GSP150-102 3Φ200

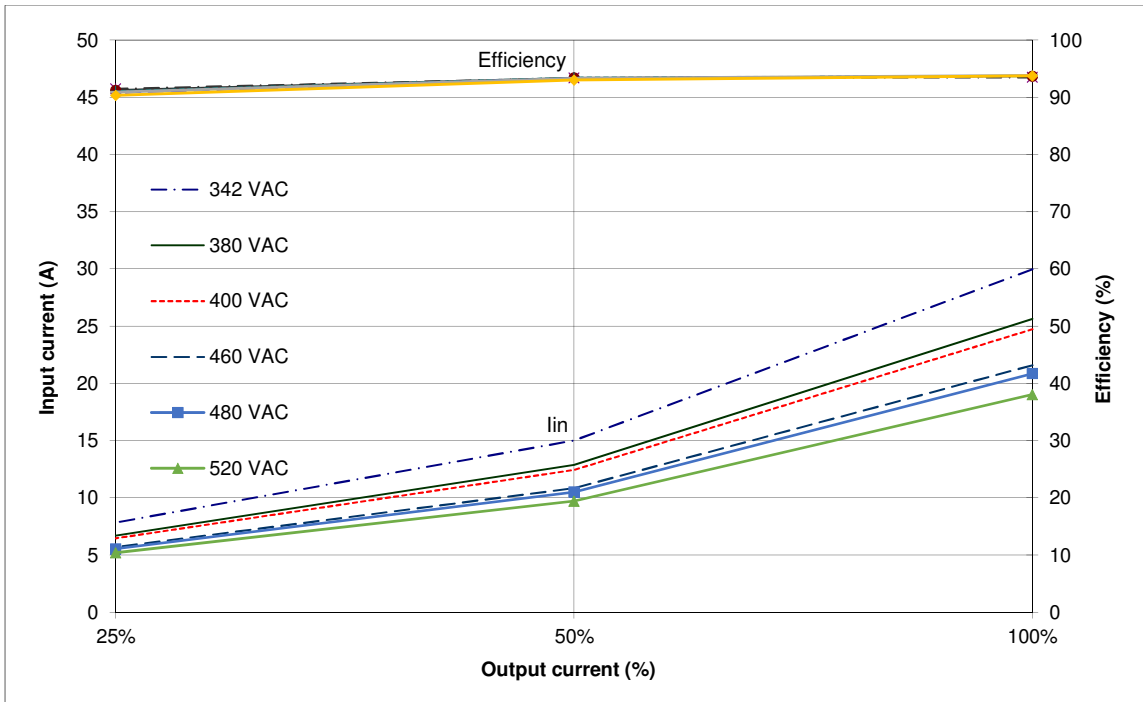
Conditions:  
Vin: 170~265 VAC  
Vout: 100%  
Ta: 25°C



(3). Efficiency and Input current vs. Output current

GSP600--25.5 3Φ400/3Φ480

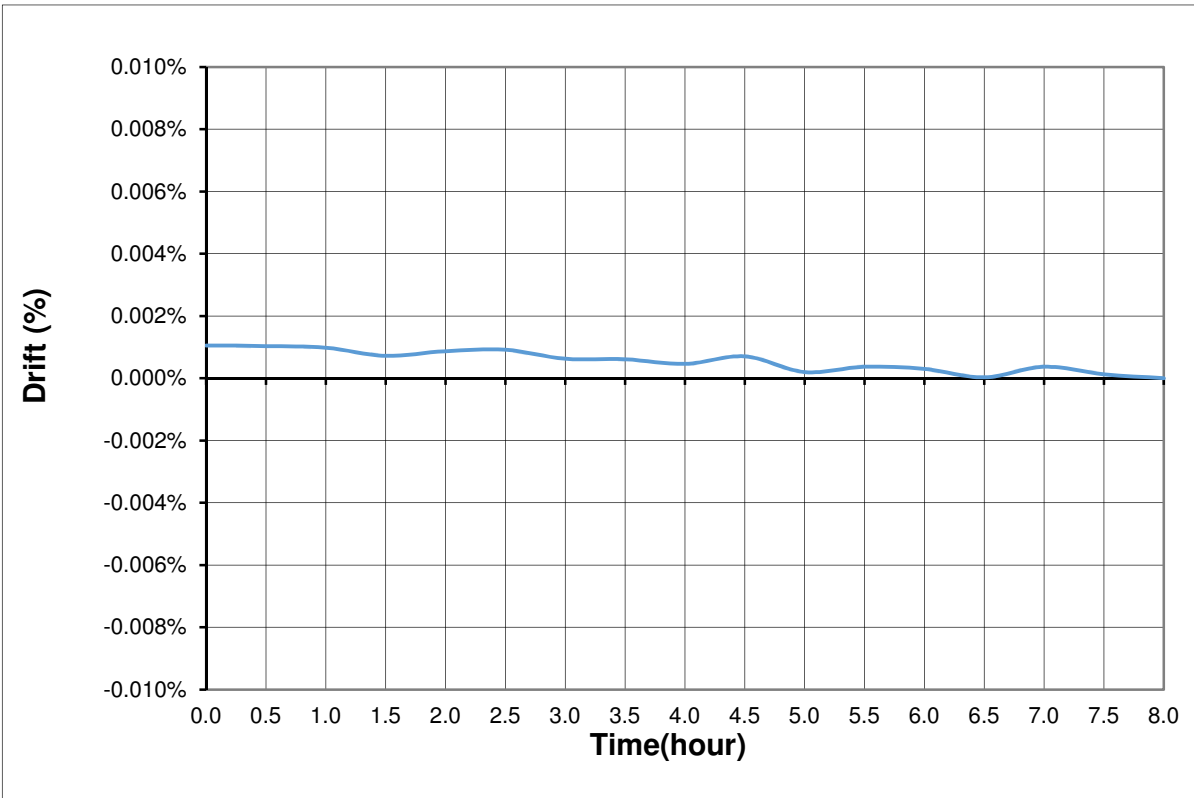
Conditions:  
 Vin: 342~520 VAC  
 Vout: 100%  
 Ta: 25°C



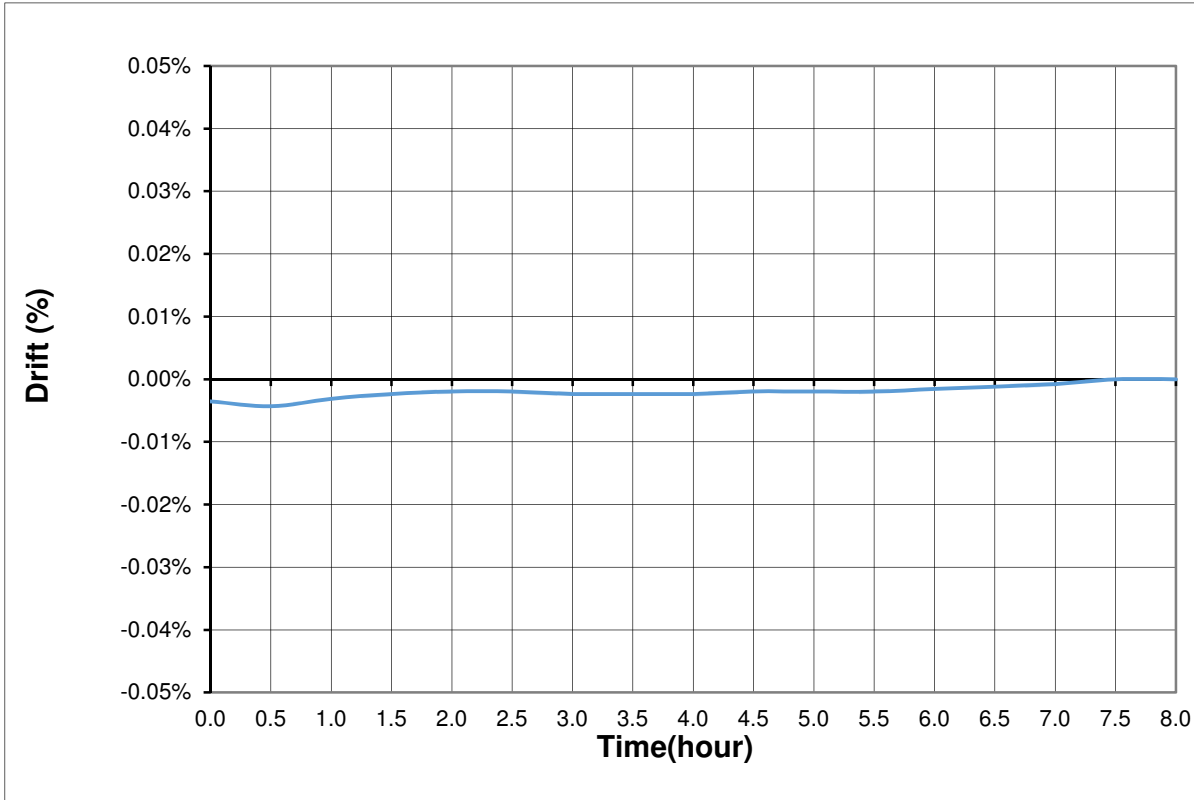
**2.2 Warm up drift & stability**

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

**GSP60-225 C.V mode**



**GSP60-225 C.C mode**

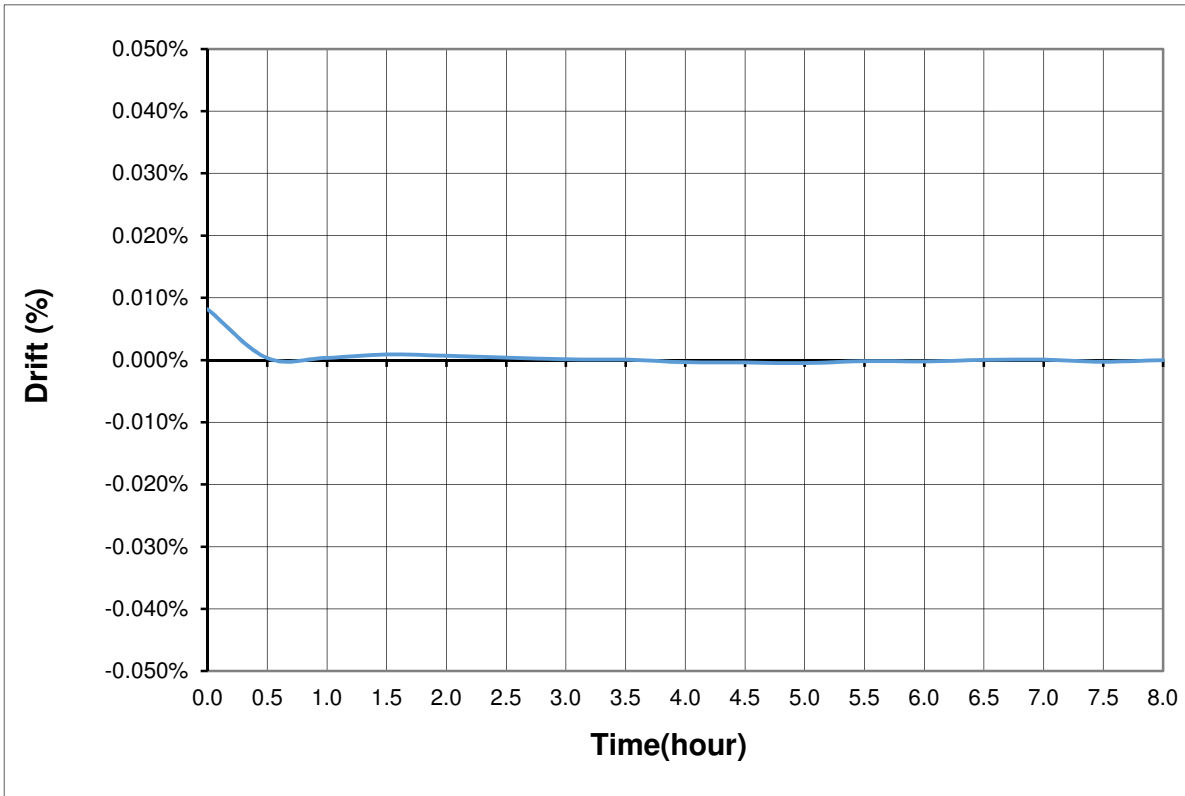




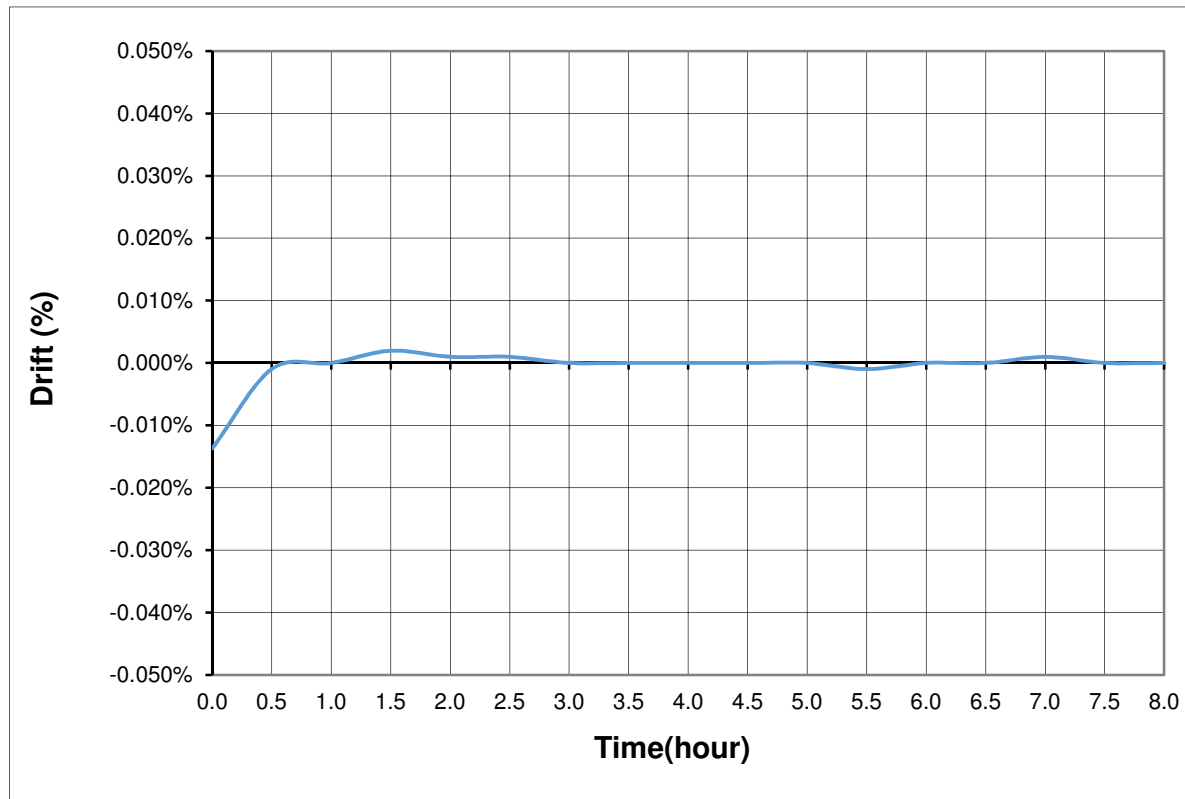
**2.2 Warm up drift & stability**

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

**GSP150-102 C.V mode**



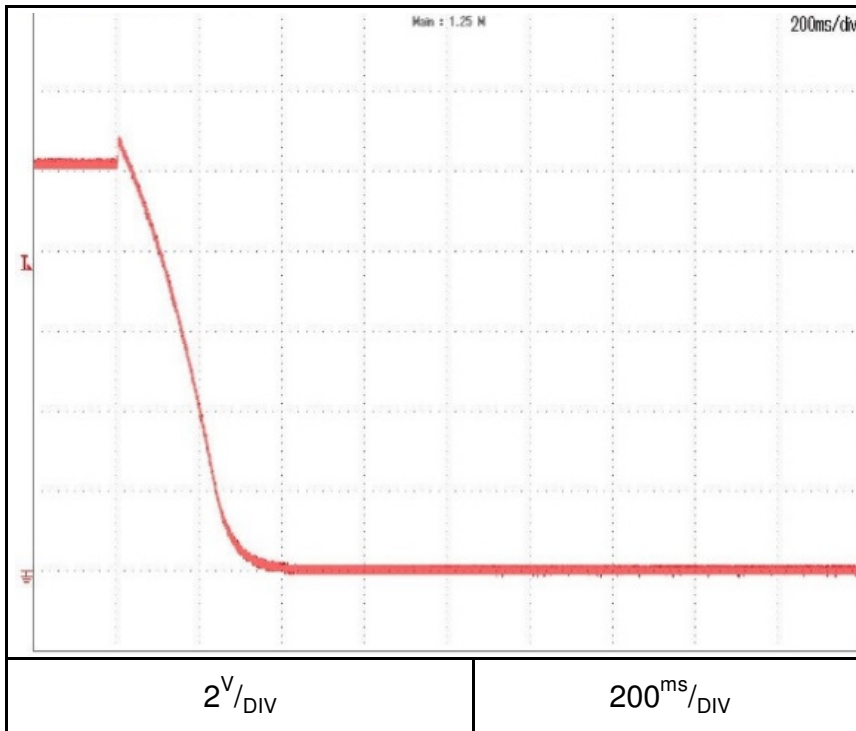
**GSP150-102 C.C mode**



**2.3 Over voltage protection (OVP) characteristic**

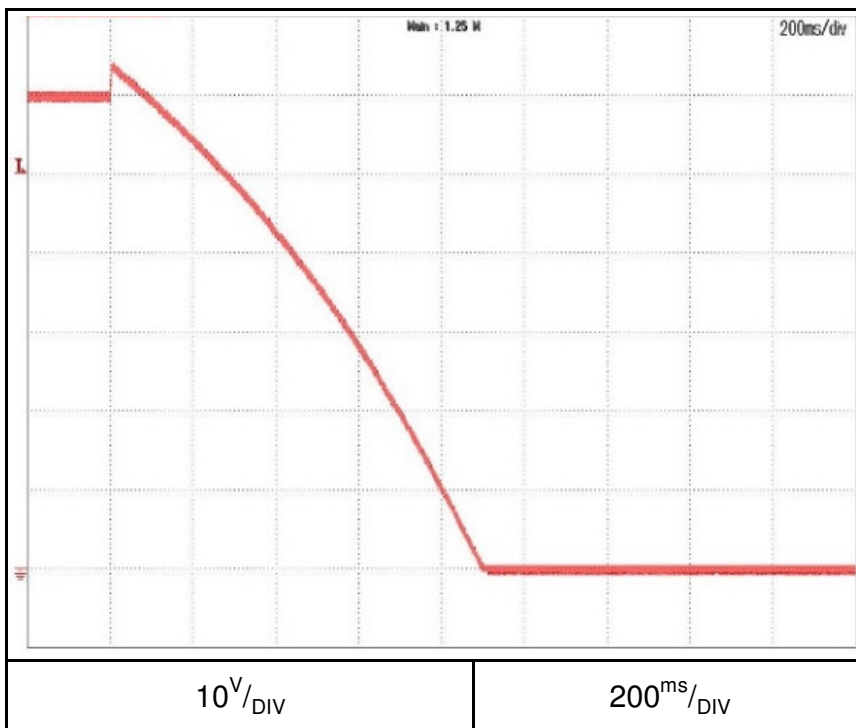
Conditions: Vset: 100%  
Iout: 0%  
Ta = 25 °C

**GSP10-1500**



OVP setting:10.5V

**GSP60-255**

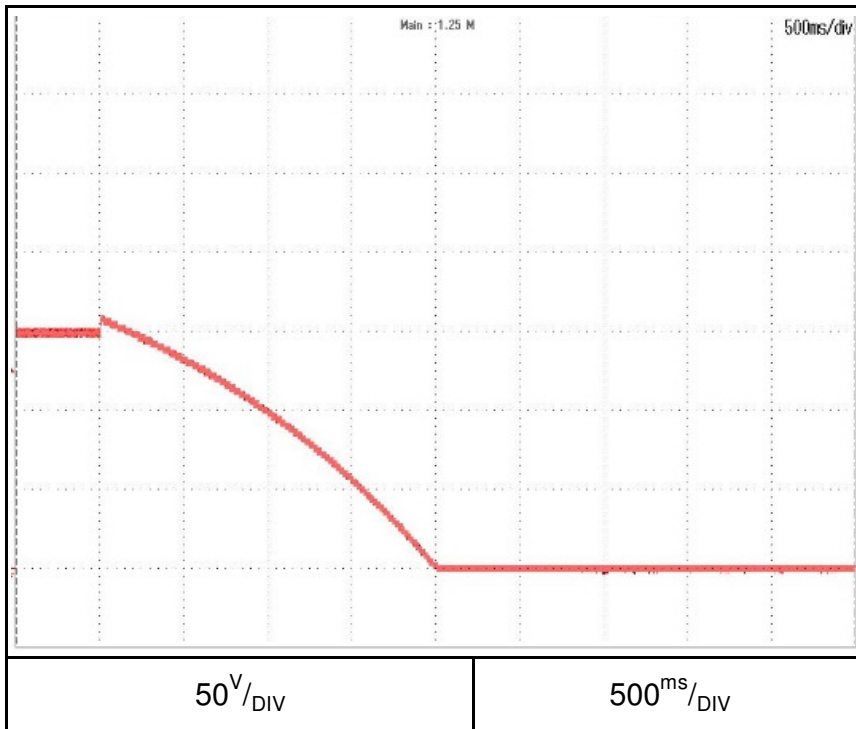


OVP setting:63V

**2.3 Over voltage protection (OVP) characteristic**

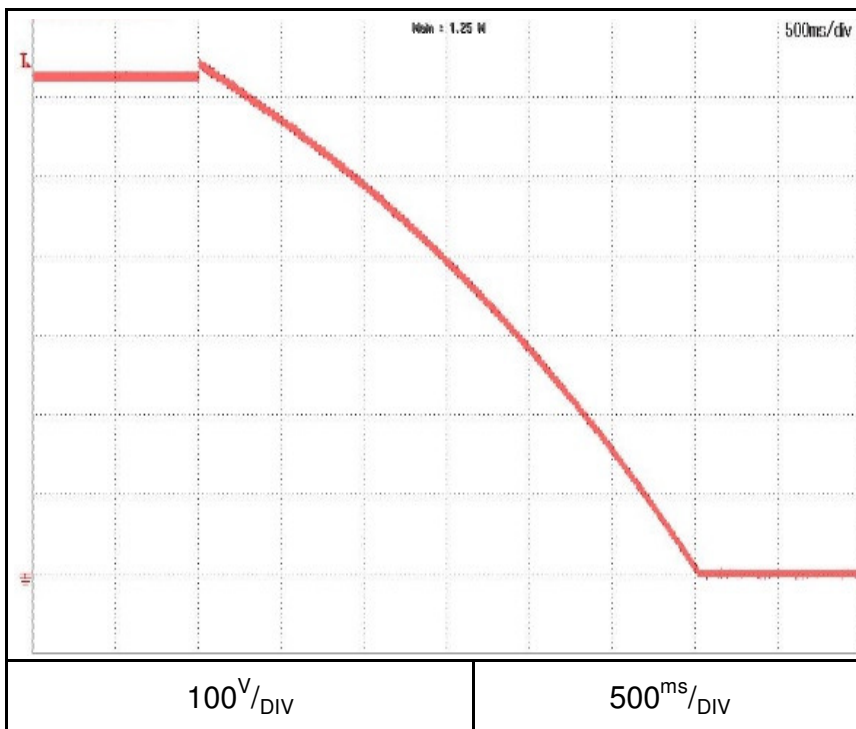
Conditions: Vset: 100%  
Iout: 0%  
Ta = 25°C

**GSP150-102**



OVP setting:157.5V

**GSP600-25.5**

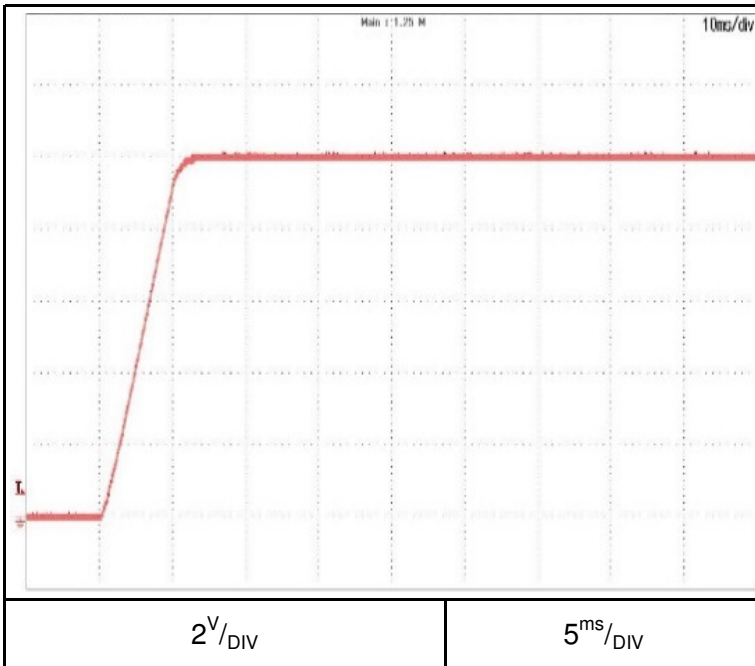


OVP setting:630V

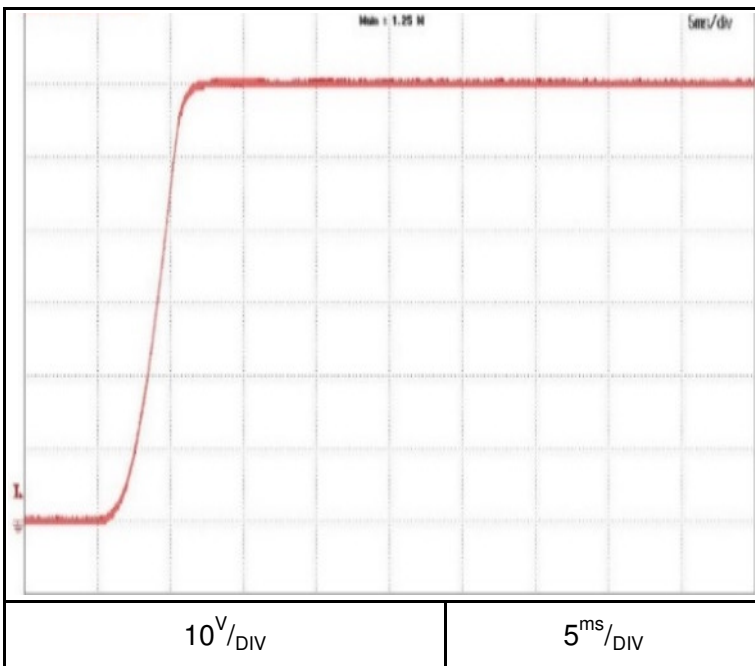
**2.4 ON/OFF Output rise characteristics**  
C.V mode

Conditions: Vin:Nominal  
Vout: 100%  
Iout: 0%  
Iset=105%  
Ta = 25°C

**GSP10-1500**



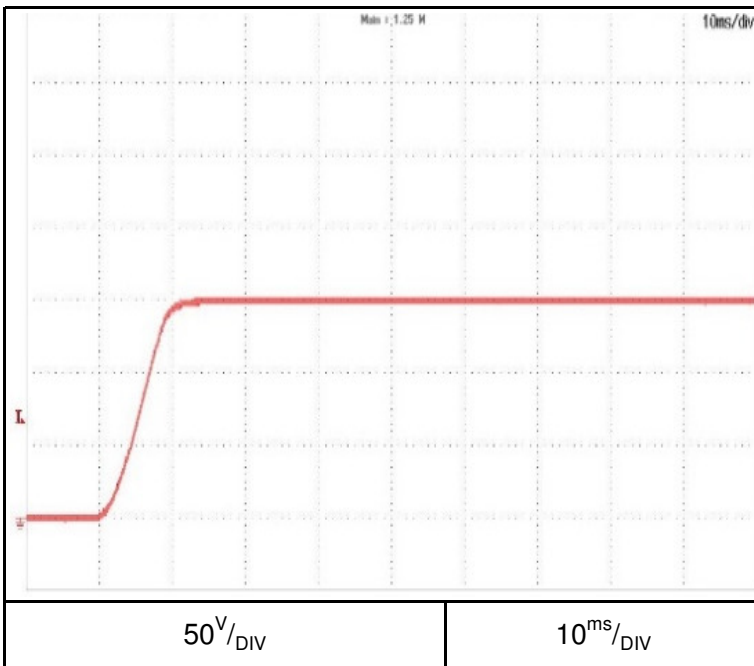
**GSP60-255**



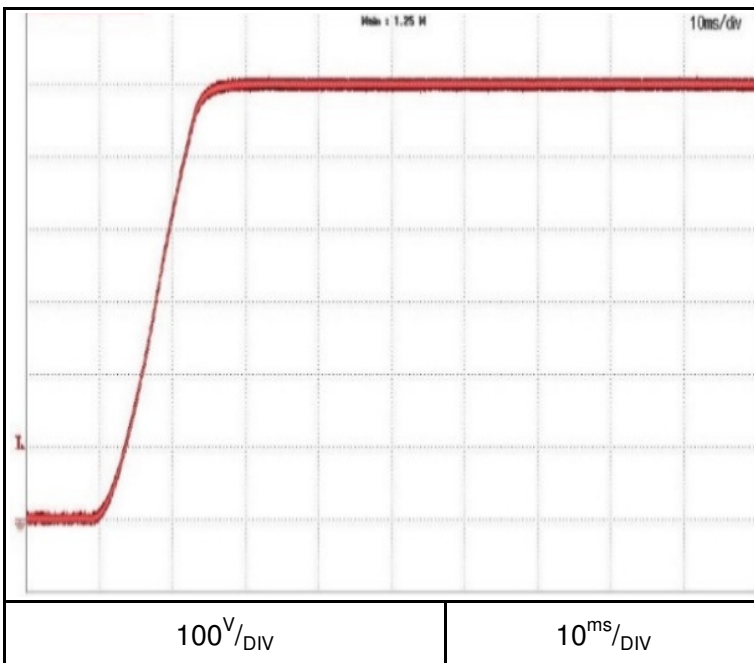
**2.4 ON/OFF Output rise characteristics**  
C.V mode

Conditions: Vin:Nominal  
Vout: 100%  
Iout: 0%  
Iset=105%  
Ta = 25°C

**GSP150-102**



**GSP600-25.5**



## 2.4 ON/OFF Output rise characteristics

C.V mode

Conditions: Vin:Nominal

Vout: 100%

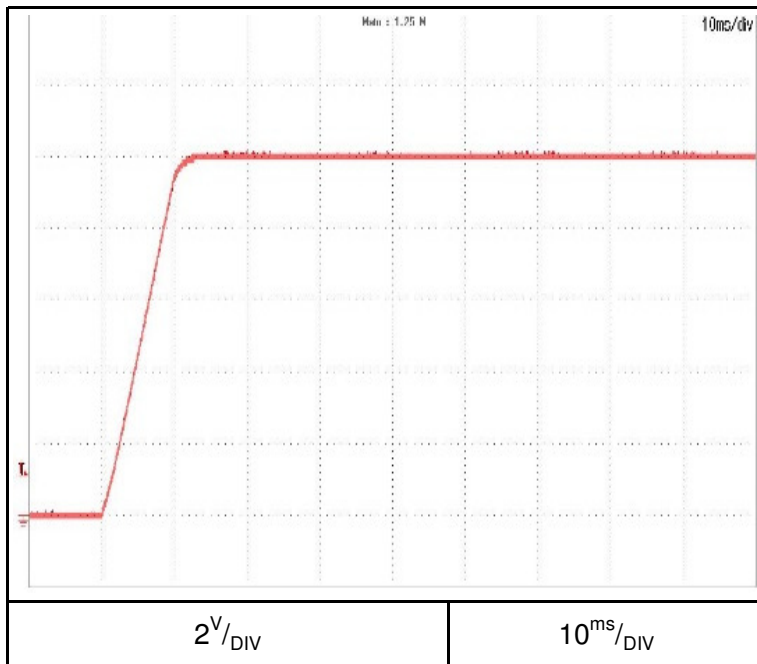
Iout: 100%

Iset=105%

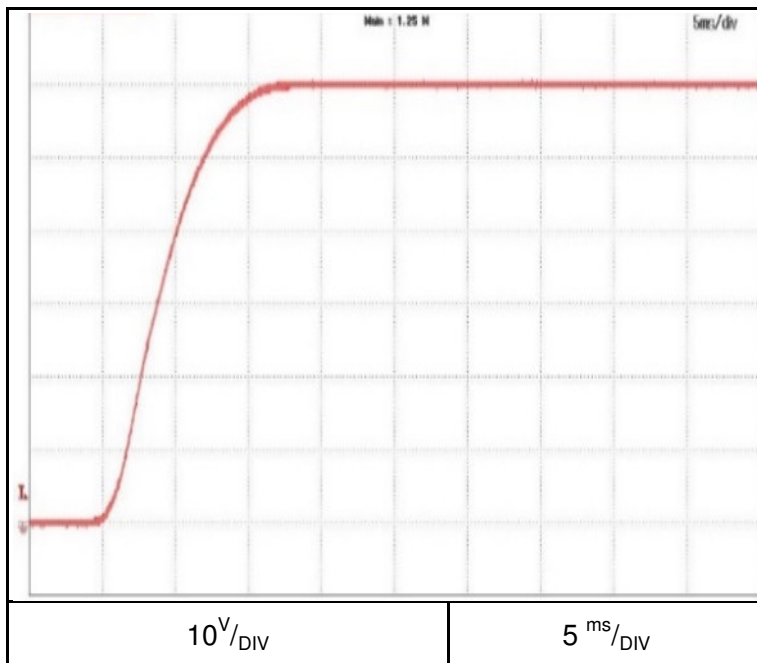
Load: CR

Ta = 25°C

GSP10-1500



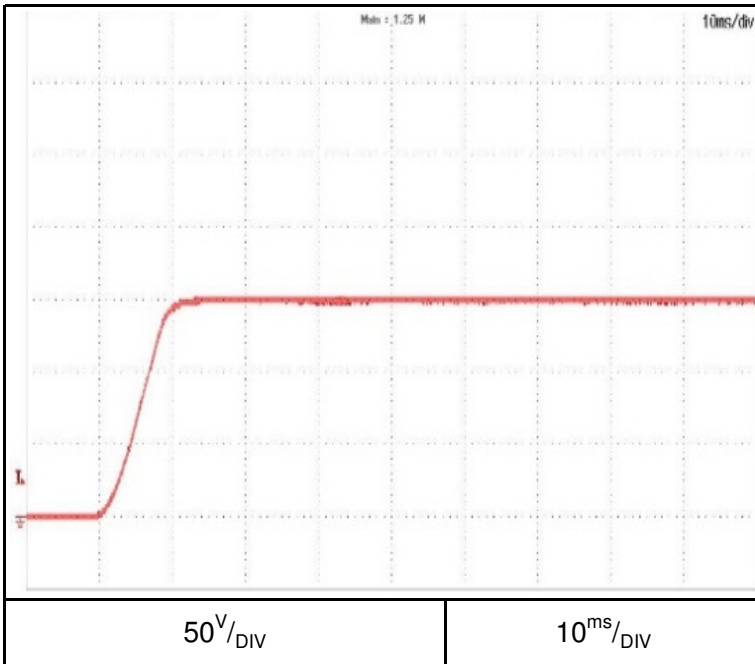
GSP60-255



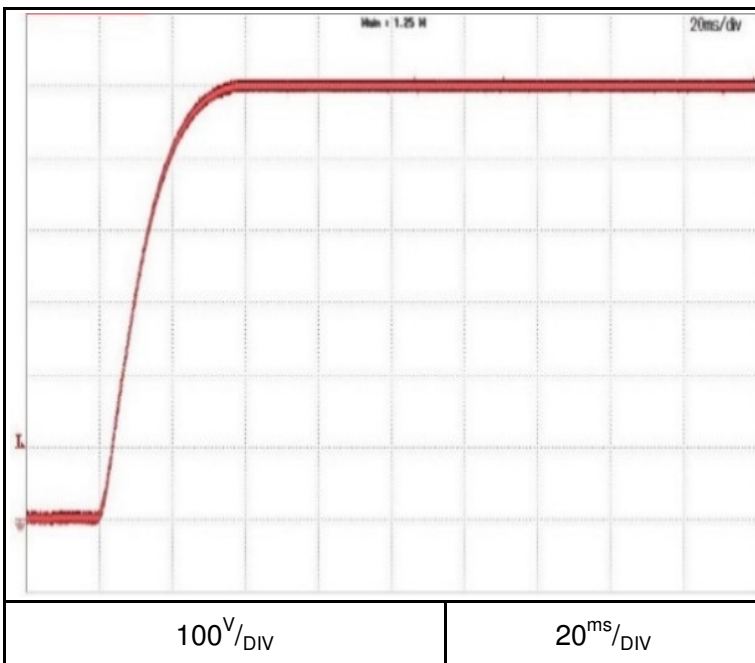
**2.4 ON/OFF Output rise characteristics**  
C.V mode

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

**GSP150-102**



**GSP600-25.5**



## 2.4 ON/OFF Output rise characteristics

C.C mode

Conditions: Vin:Nominal

Vout: 100%

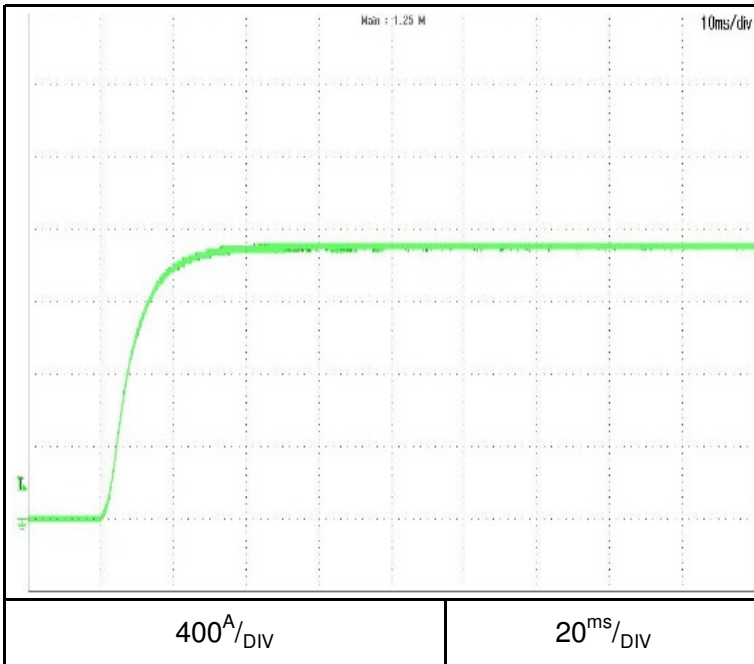
Iout: 100%

Vset=105%

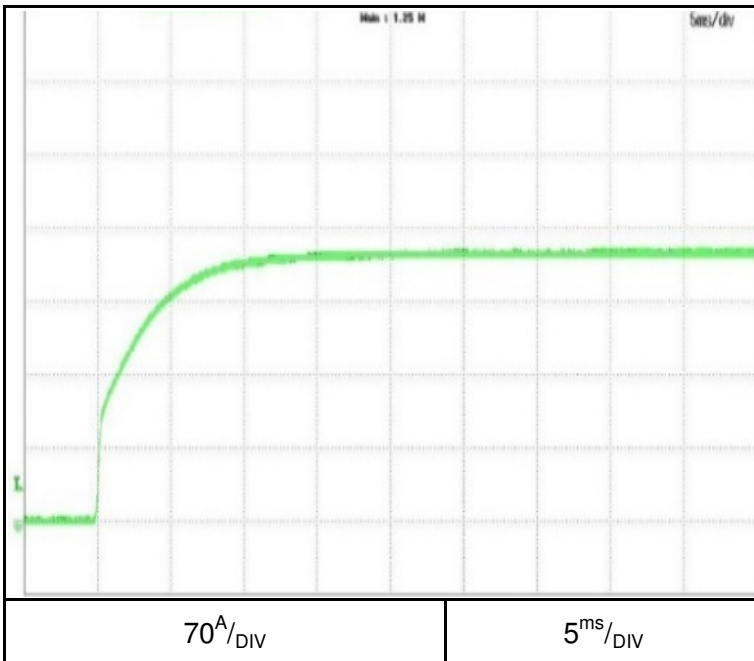
Load: CR

Ta = 25°C

GSP10-1500



GSP60-255

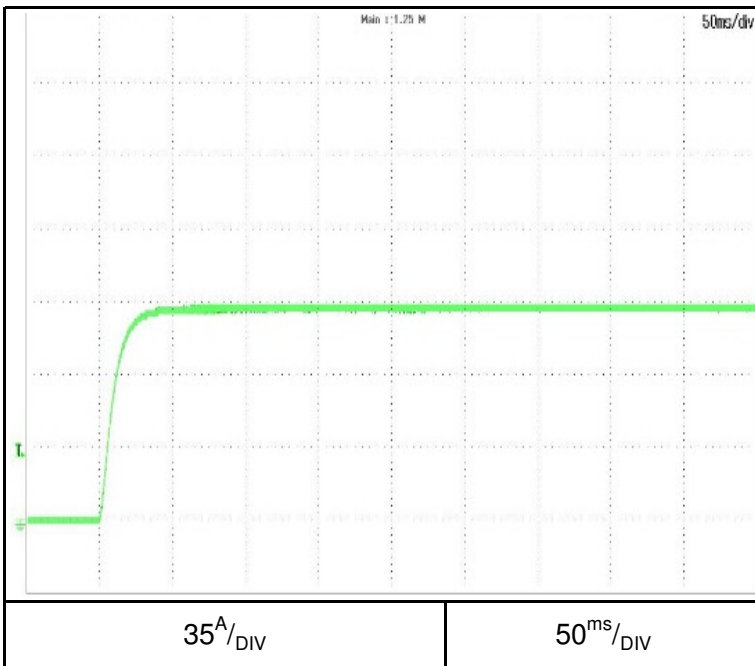




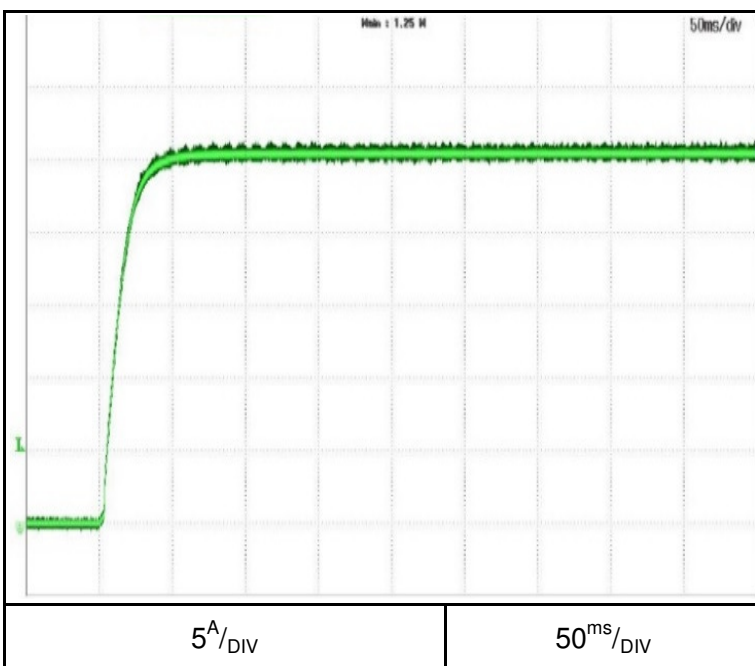
**2.4 ON/OFF Output rise characteristics**  
C.C mode

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

**GSP150-102**



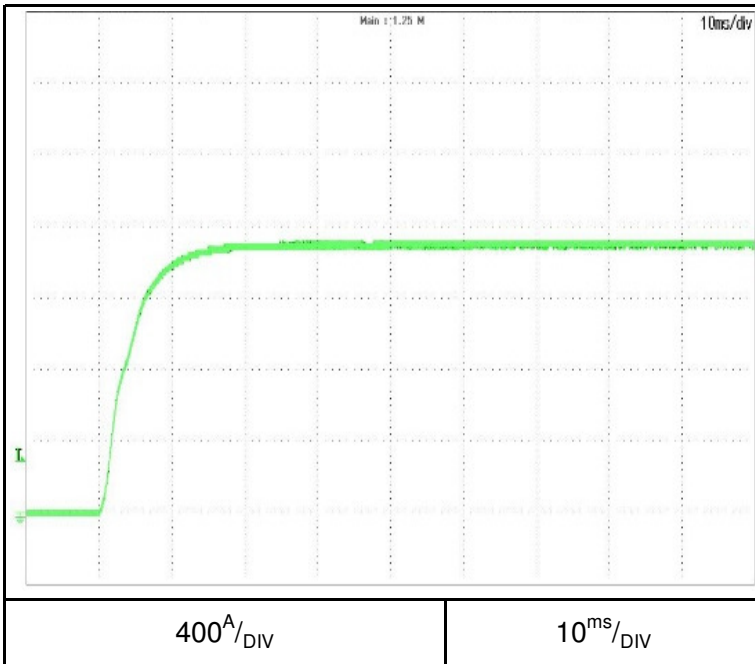
**GSP600-25.5**



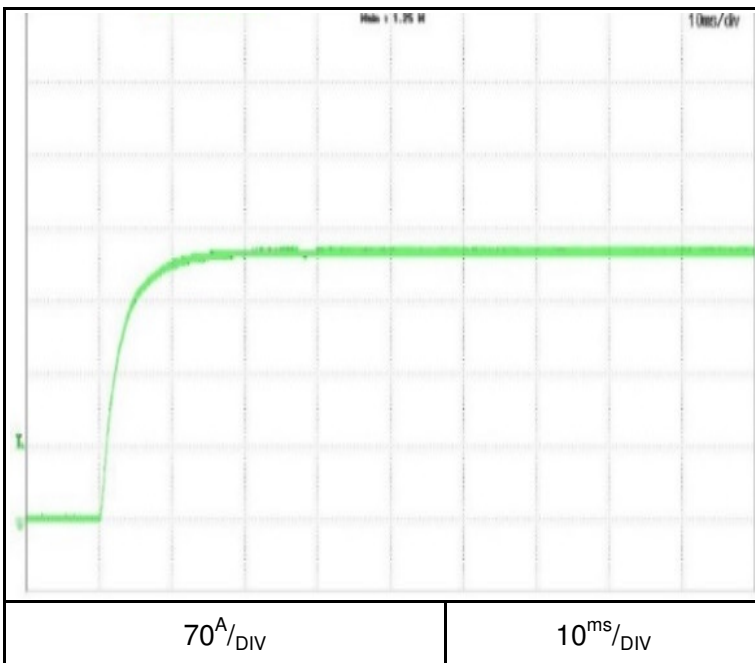
**2.4 ON/OFF Output rise characteristics**  
C.C mode

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

**GSP10-1500**



**GSP60-255**

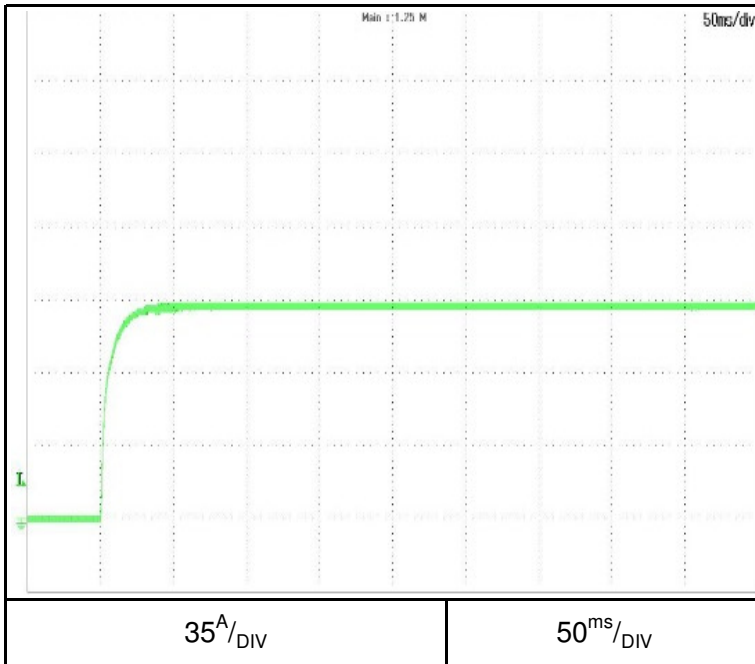


## 2.4 ON/OFF Output rise characteristics

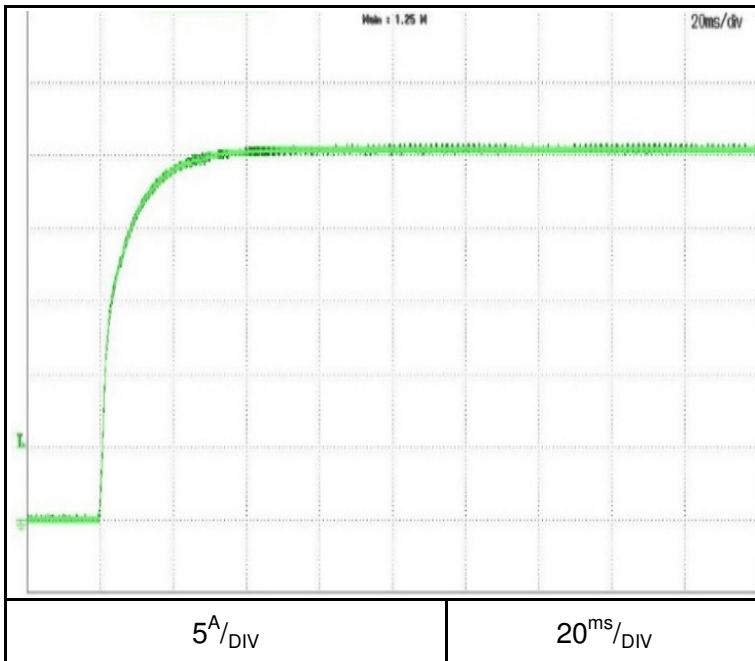
C.C mode

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

GSP150-102



GSP600-25.5



## 2.5 ON/OFF Output fall characteristics

C.V mode

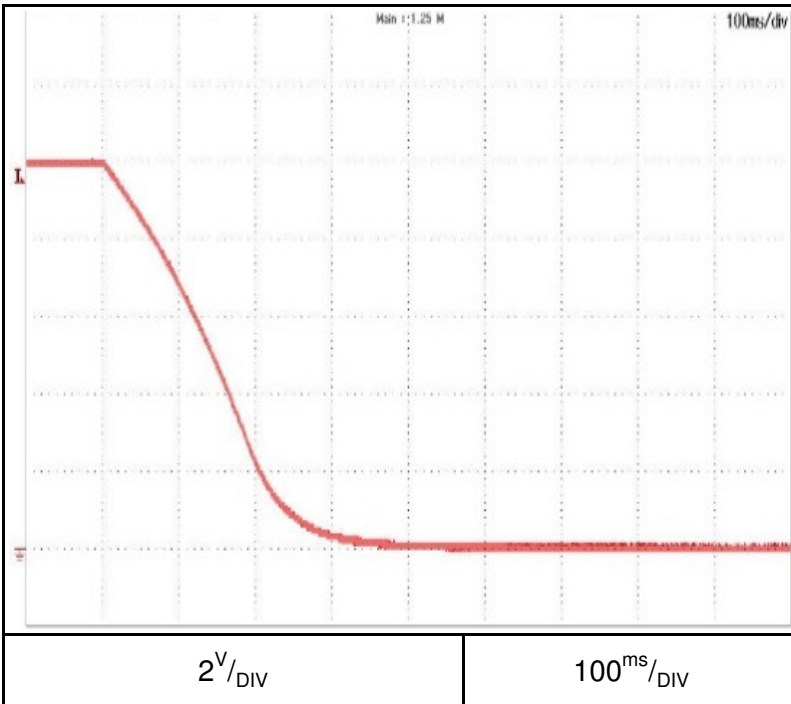
Conditions: Vin:Nominal

Vout: 100%

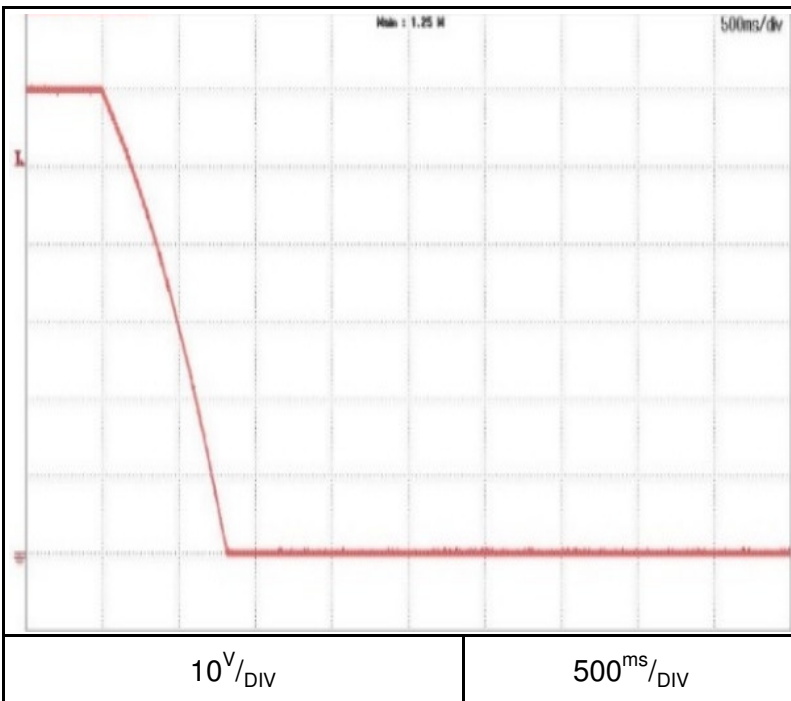
Iout: 0%

Ta = 25°C

GSP10-1500



GSP60-255



**2.5 ON/OFF Output fall characteristics**

C.V mode

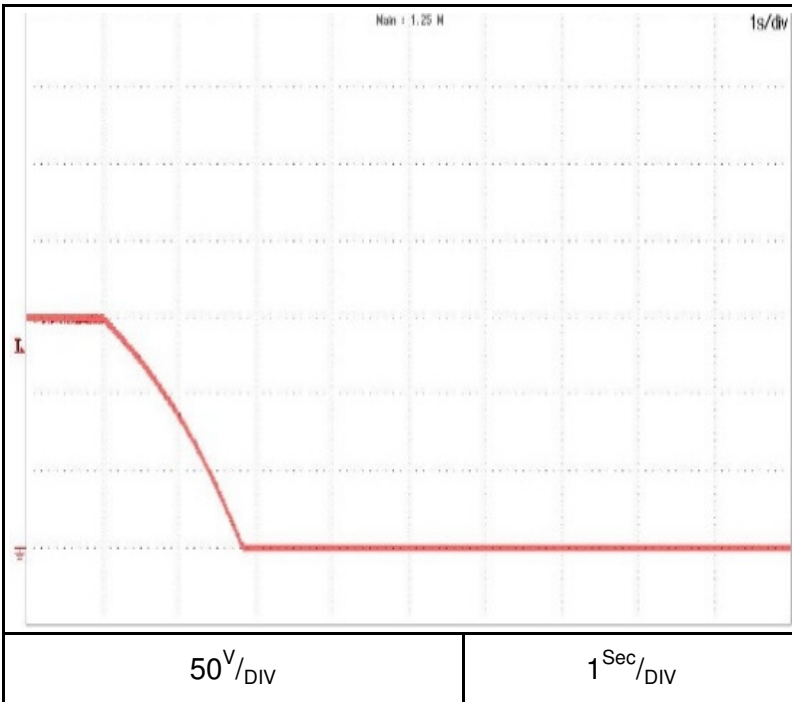
Conditions: Vin:Nominal

Vout: 100%

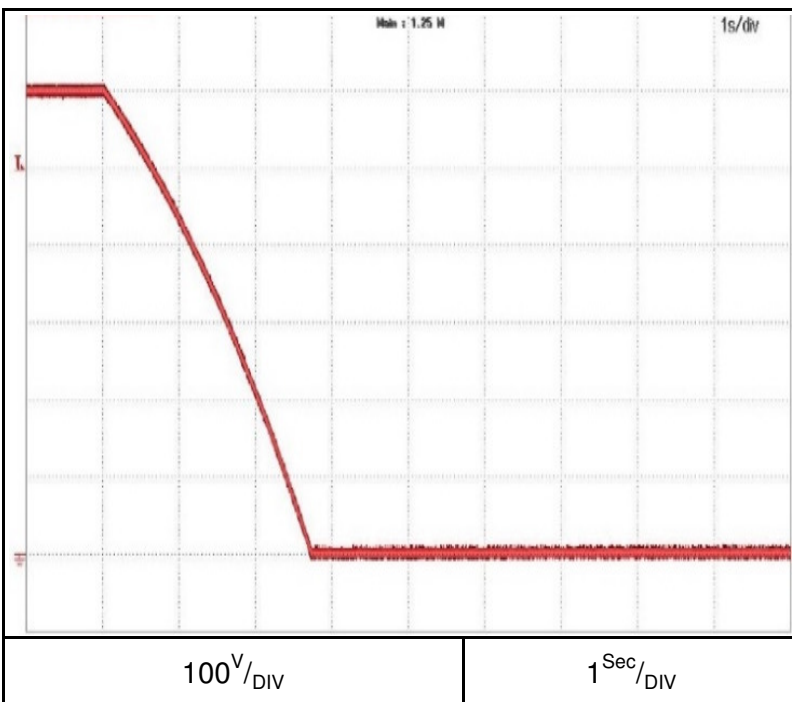
Iout: 0%

Ta = 25°C

GSP150-102



GSP600-25.5



## 2.5 ON/OFF Output fall characteristics

C.V mode

Conditions: Vin:Nominal

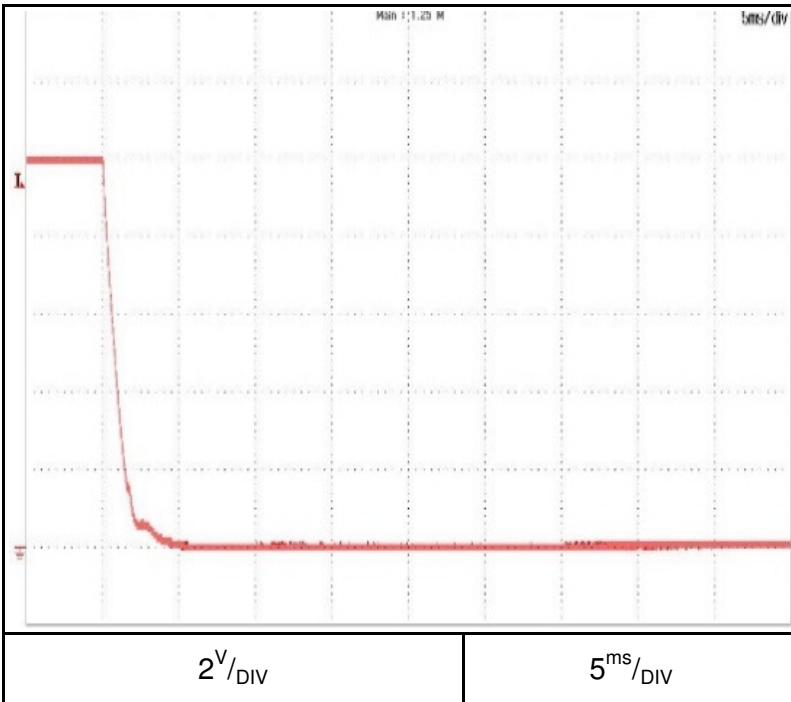
Vout: 100%

Iout: 100%

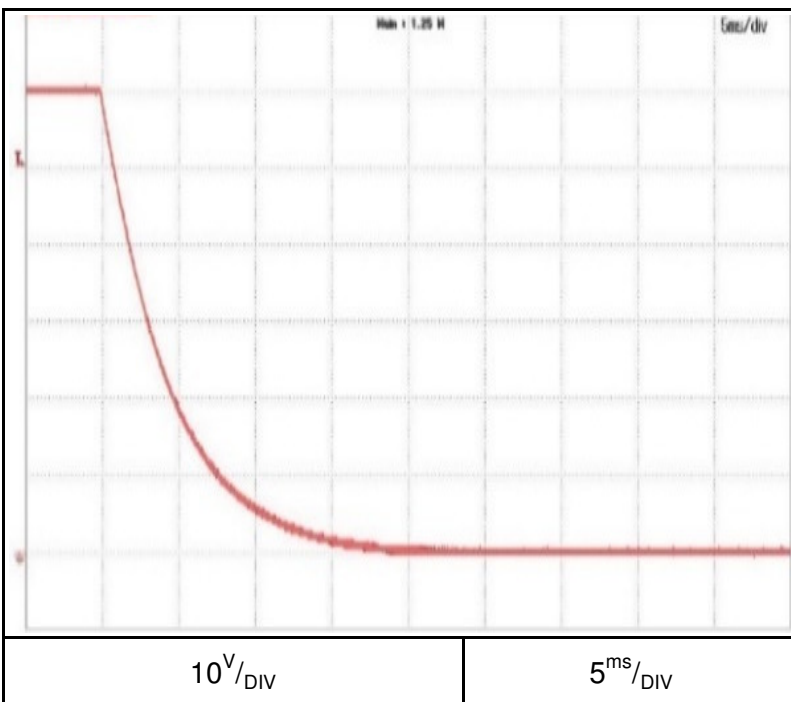
Load: CR

Ta = 25°C

GSP10-1500



GSP60-255



**2.5 ON/OFF Output fall characteristics**

C.V mode

Conditions: Vin:Nominal

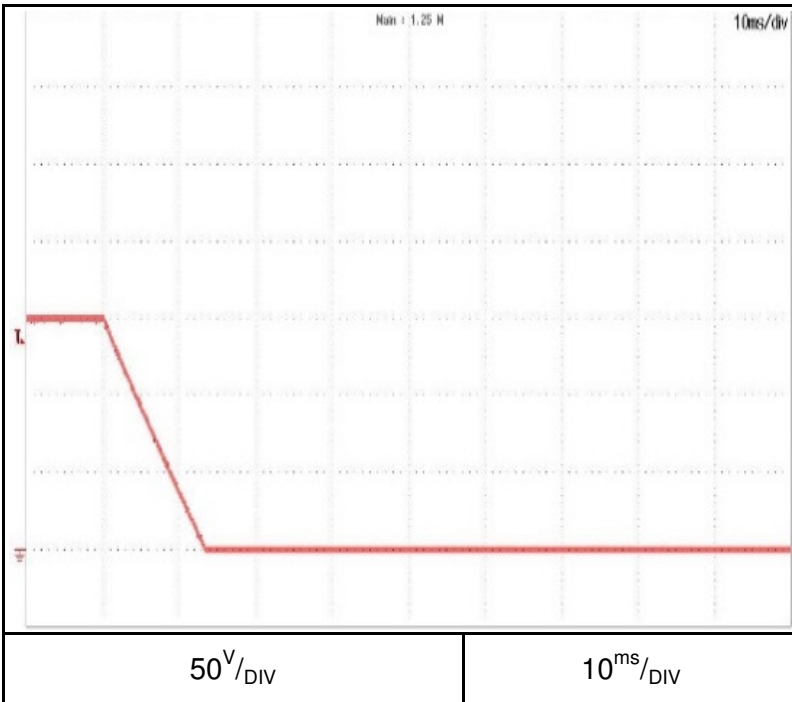
Vout: 100%

Iout: 100%

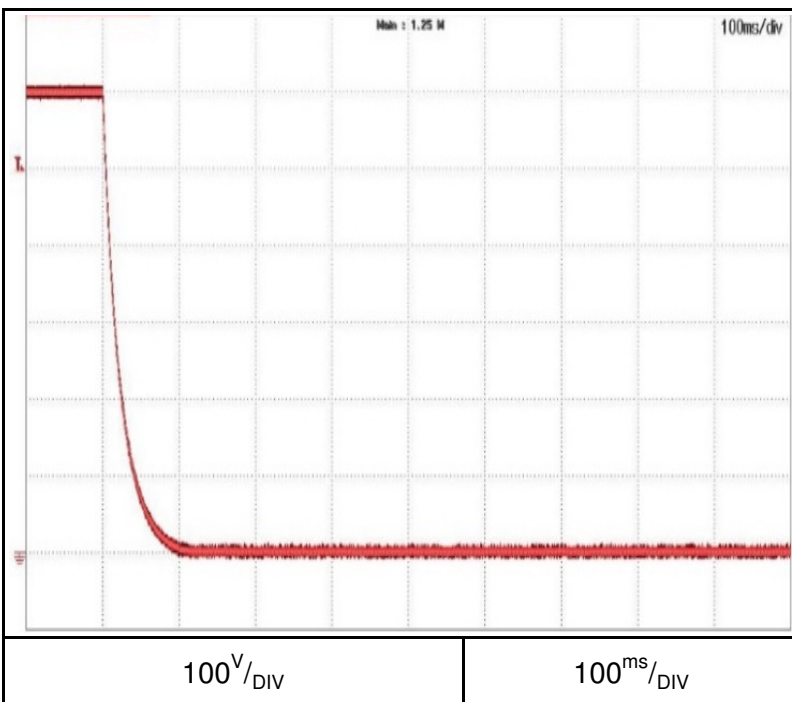
Load: CR

Ta = 25°C

GSP150-102



GSP600-25.5



## 2.5 ON/OFF Output fall characteristics

C.C mode

Conditions: Vin:Nominal

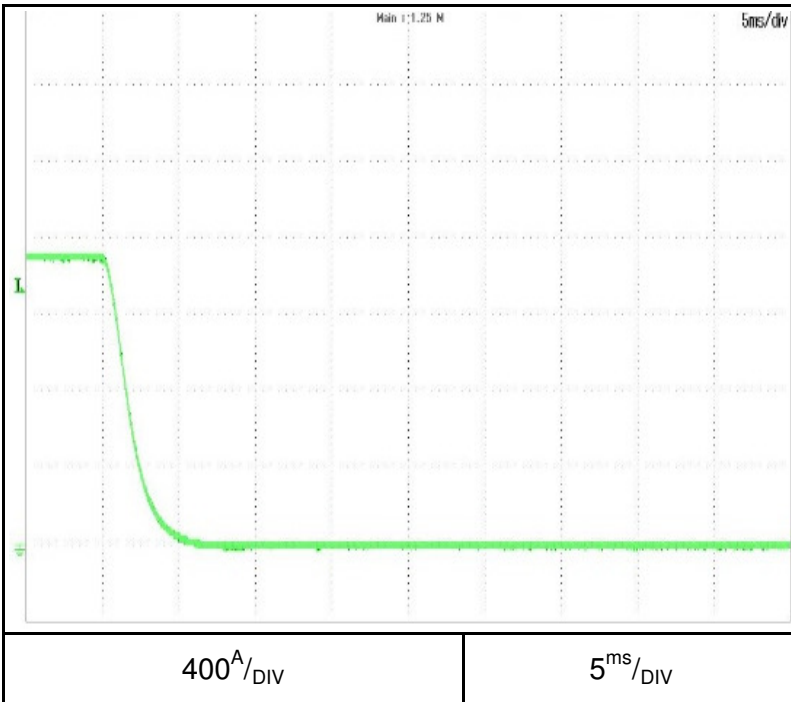
Vout: 100%

Iout: 100%

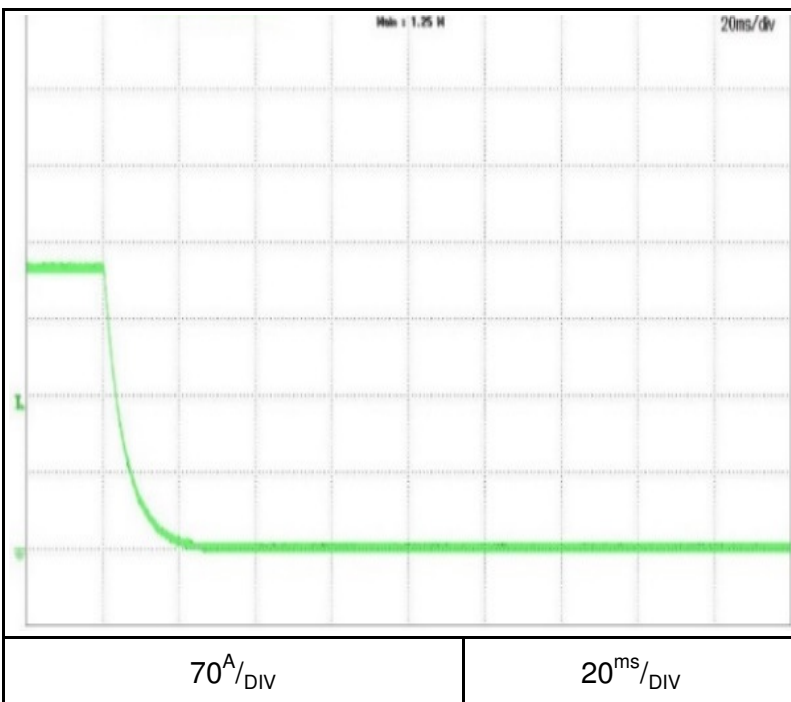
Load: CR

Ta = 25°C

GSP10-1500



GSP60-255





## 2.5 ON/OFF Output fall characteristics

C.C mode

Conditions: Vin:Nominal

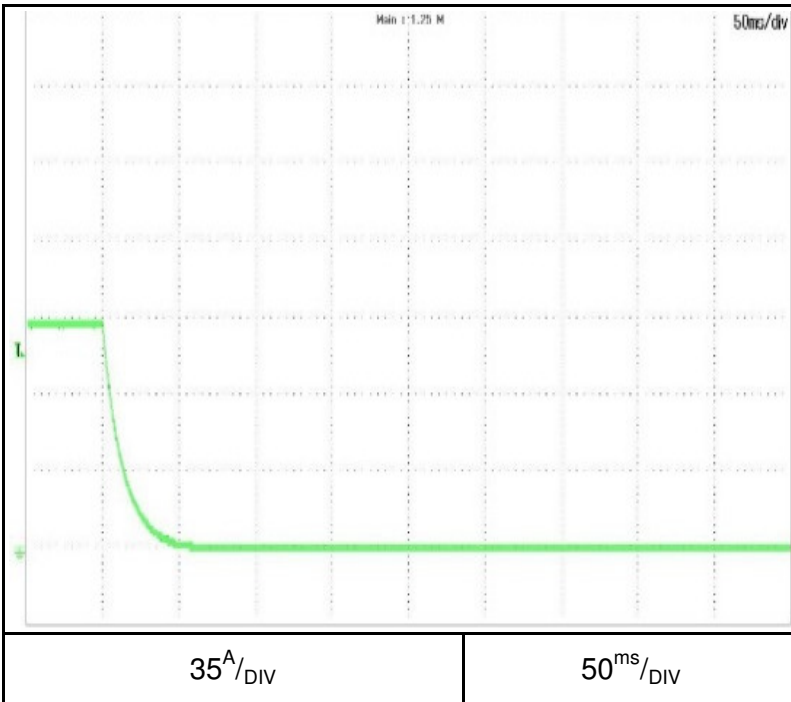
Vout: 100%

Iout: 100%

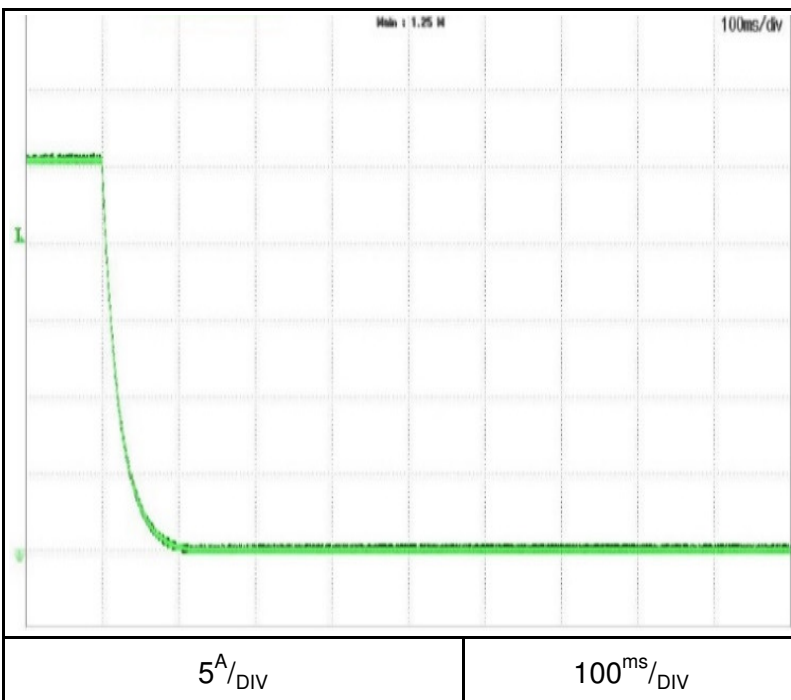
Load: CR

Ta = 25 °C

GSP150-102



GSP600-25.5

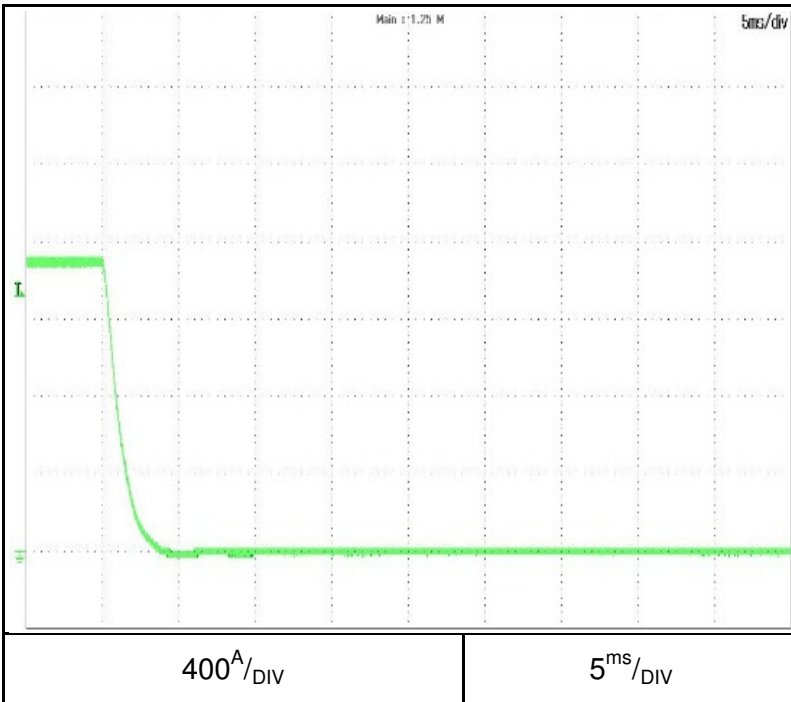


## 2.5 ON/OFF Output fall characteristics

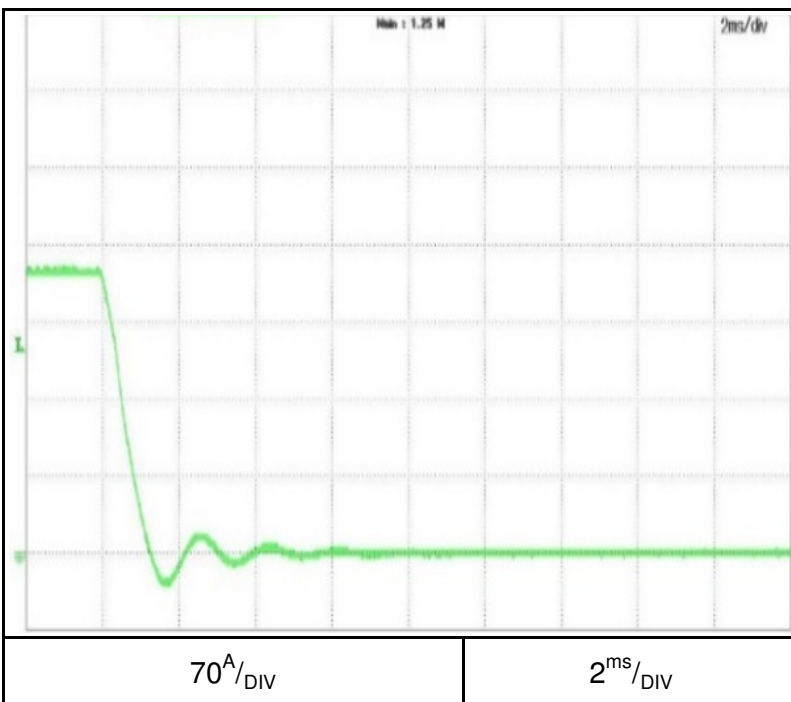
C.C mode

Conditions: Vin:Nominal  
Iout: 100%  
shorted output  
Ta = 25 °C

GSP10-1500



GSP60-255

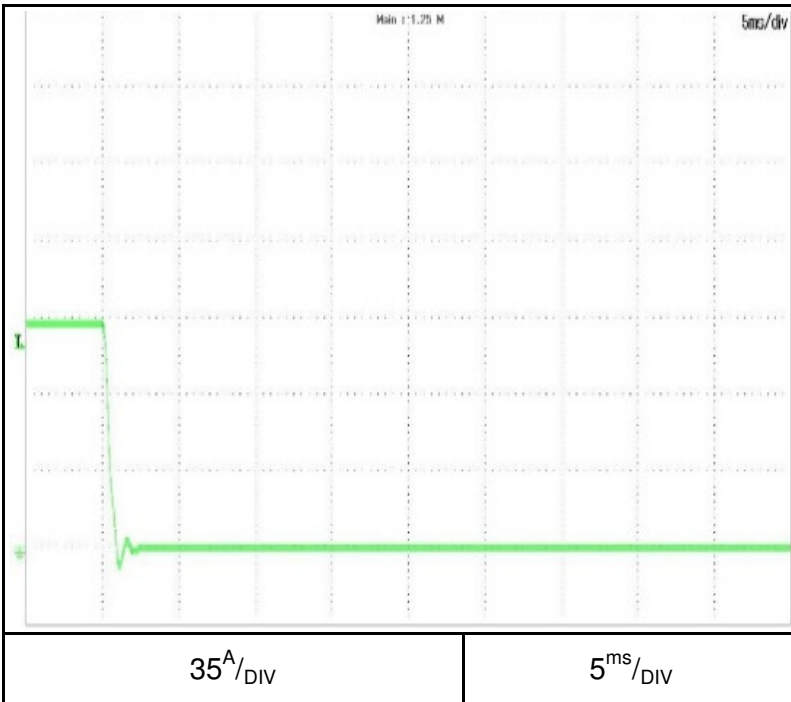


## 2.5 ON/OFF Output fall characteristics

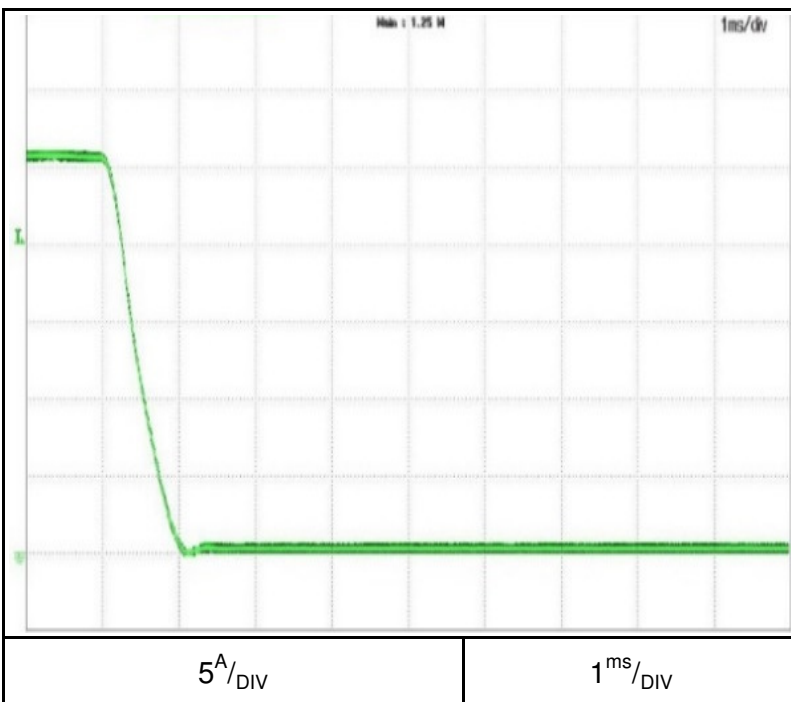
C.C mode

Conditions: Vin:Nominal  
Iout: 100%  
shorted output  
Ta = 25 °C

GSP150-102



GSP600-25.5

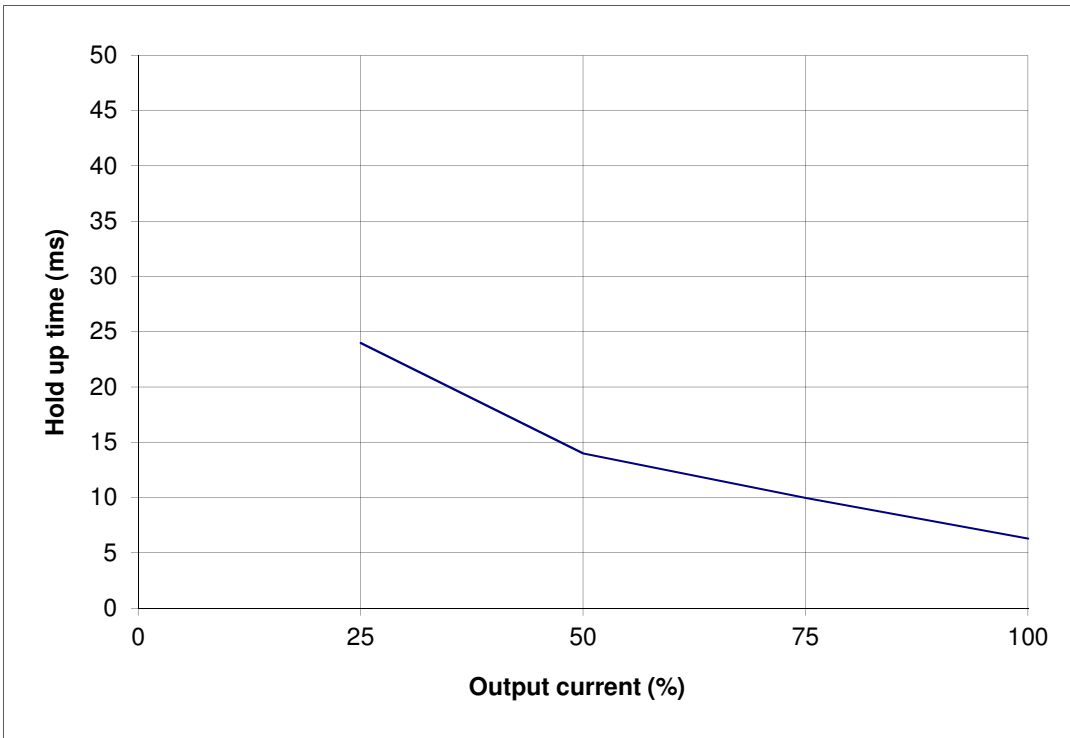


**2.6 Holdup time characteristics**

Conditions:  $T_a = 25^\circ\text{C}$   
 $V_{out}: 100\%$

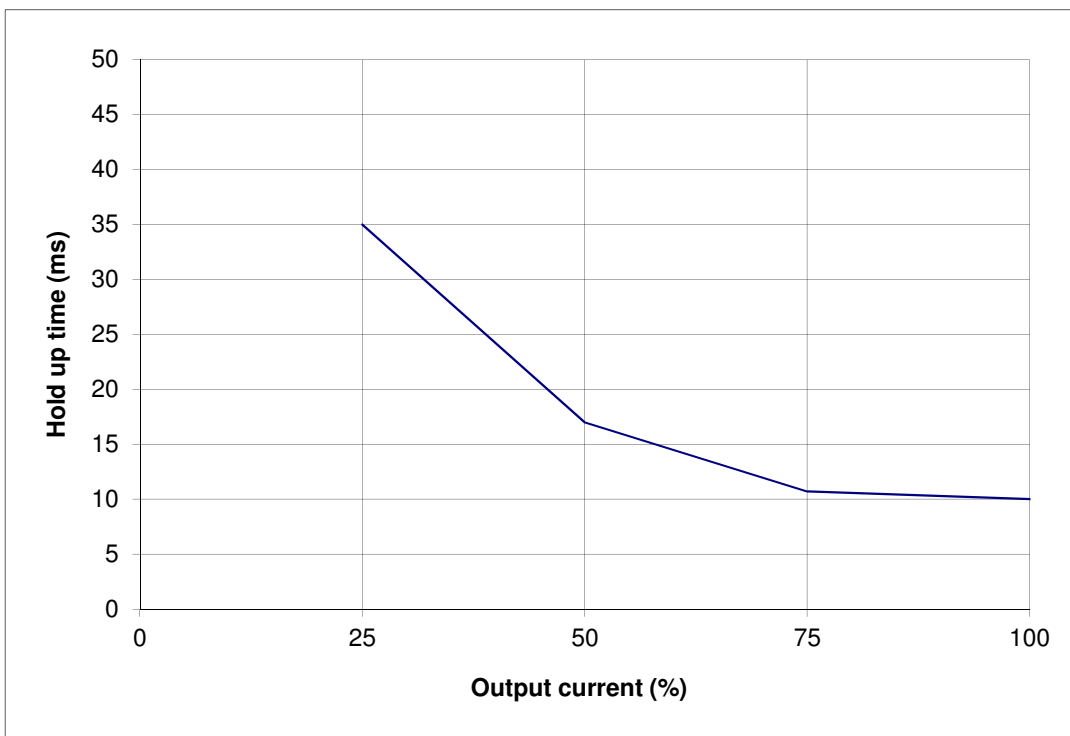
**GSP10-1500 3 $\Phi$ 200**

$V_{in}: 200\text{VAC}$



**GSP10-1500 3 $\Phi$ 400**

$V_{in}: 342\text{VAC}$

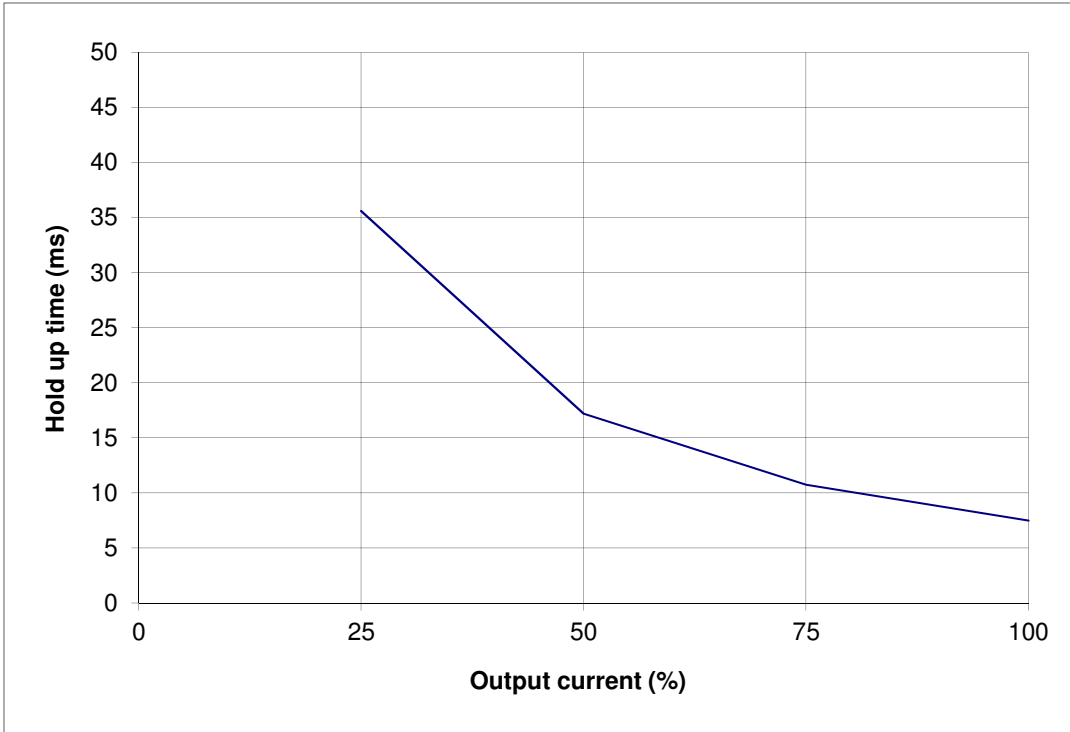


**2.6 Holdup time characteristics**

Conditions:  $T_a = 25^\circ\text{C}$   
 $V_{out}: 100\%$

**GSP10-1500 3 $\Phi$ 480**

$V_{in}: 480\text{VAC}$

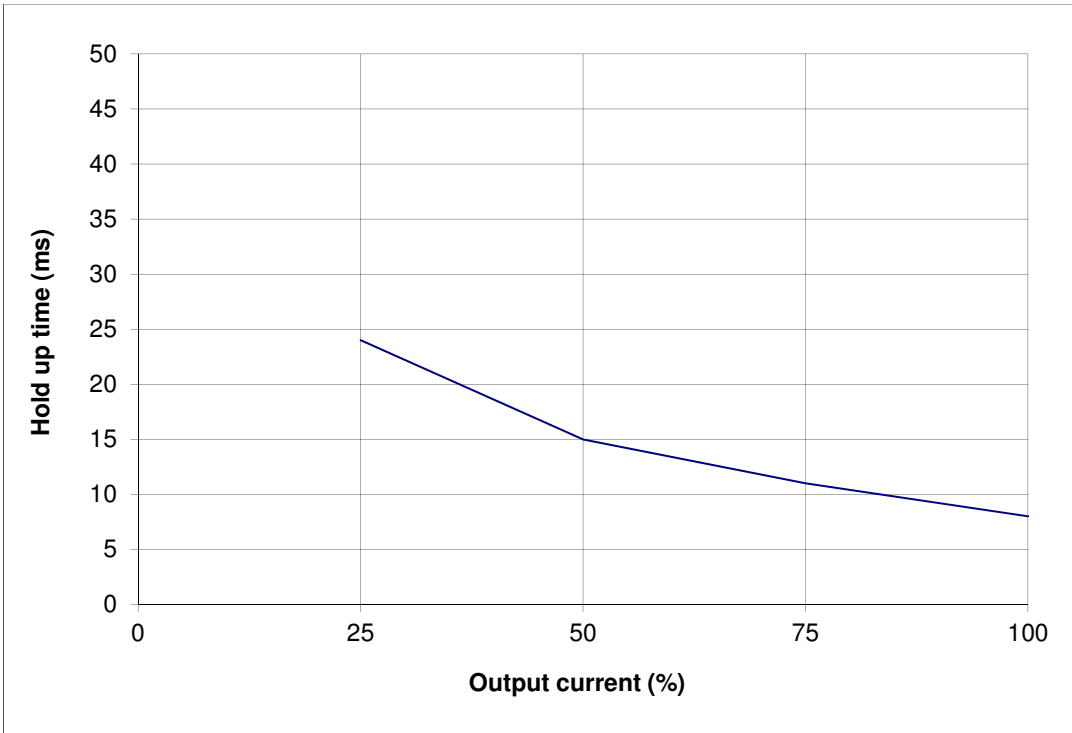


**2.6 Holdup time characteristics**

Conditions: Ta = 25°C  
Vout:100%

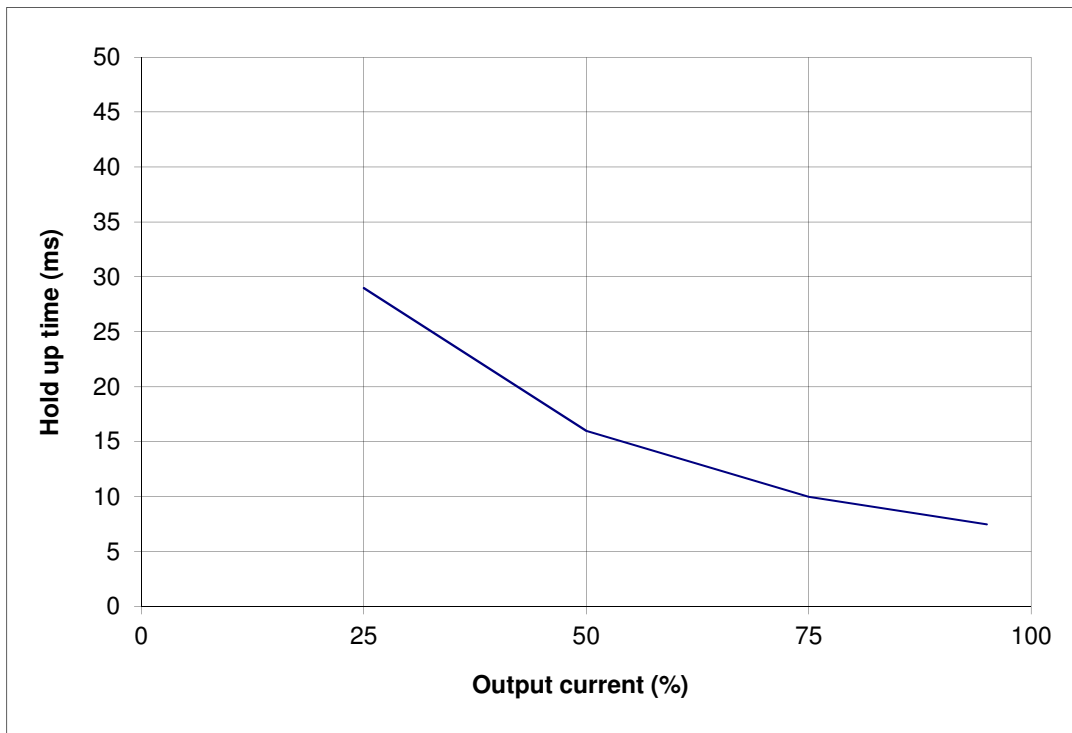
**GSP600-25.5 3Φ200**

Vin:230VAC



**GSP600-25.5 3Φ400**

Vin:400VAC

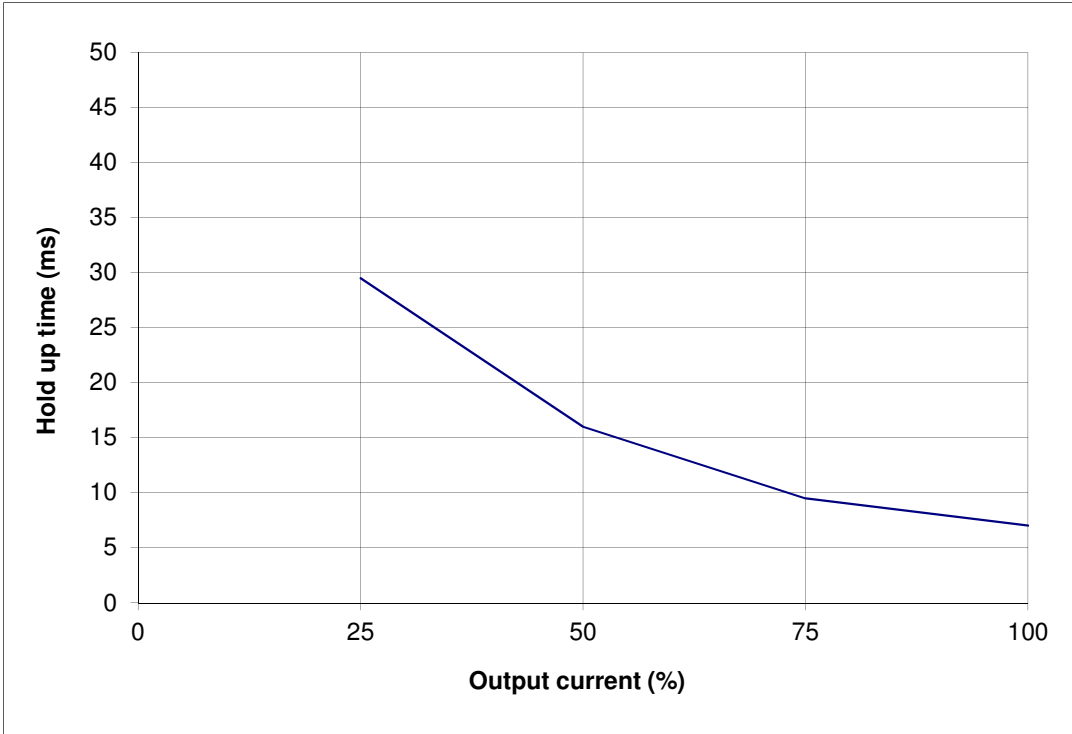


**2.6 Holdup time characteristics**

Conditions:  $T_a = 25^\circ\text{C}$   
 $V_{out}: 100\%$

**GSP600-25.5 3 $\Phi$ 480**

$V_{in}: 480\text{VAC}$

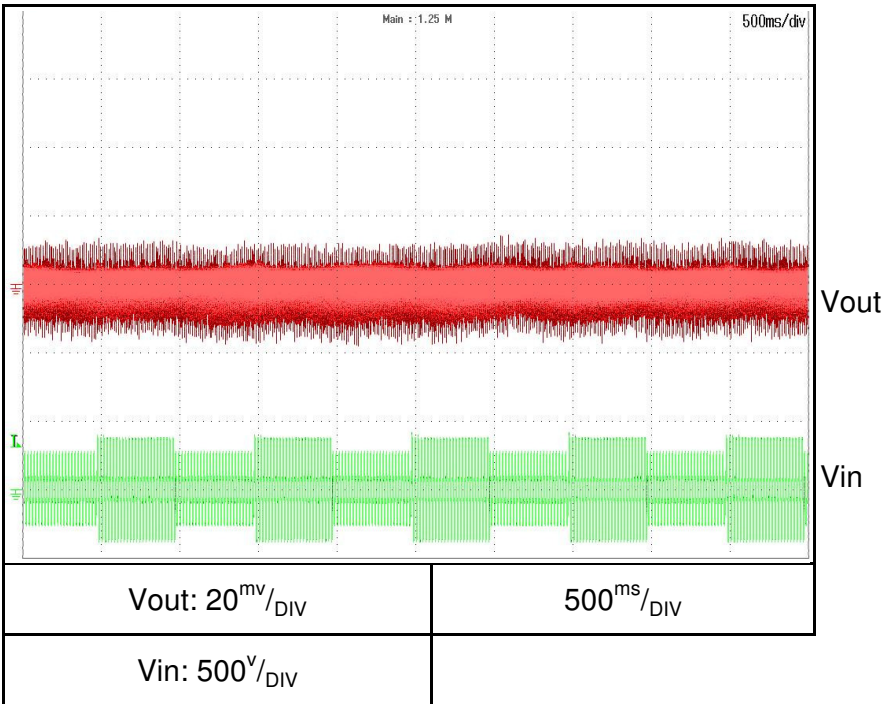


**2.7 Dynamic line response characteristics**

C.V mode

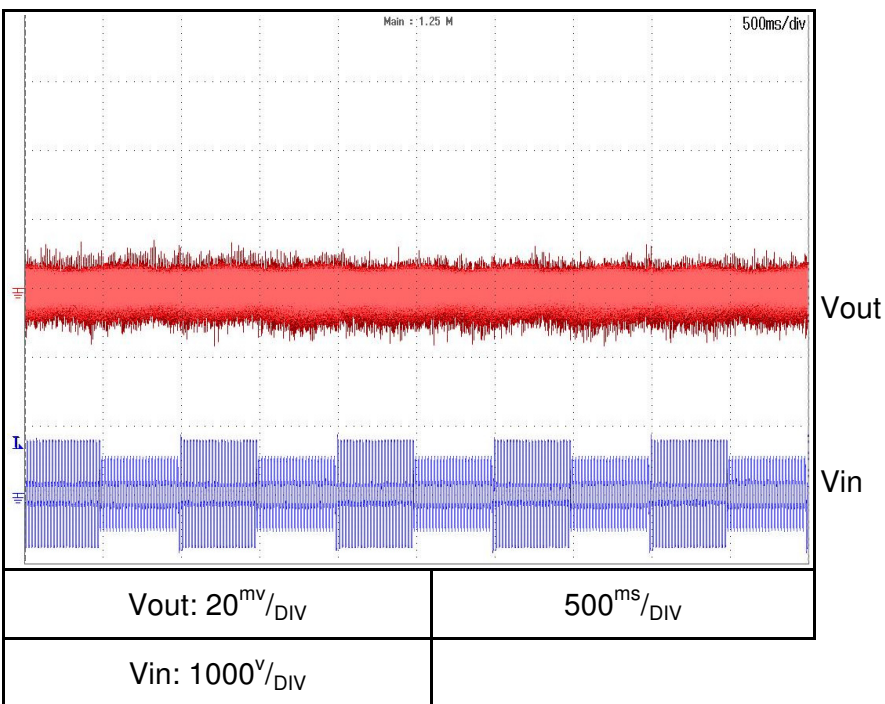
**GSP10-1500 3Φ200**

Conditions: Vout: 100%  
Iout: 100%  
Vin: 170↔265V



**GSP10-1500 3Φ480**

Conditions: Vout: 100%  
Iout: 100%  
Vin: 342↔520V



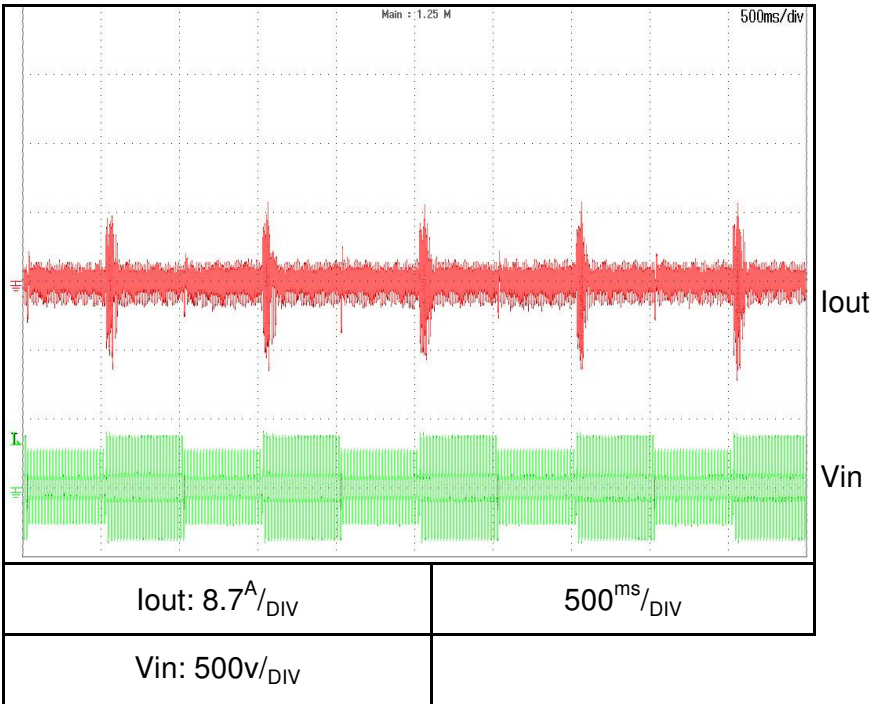


**2.7 Dynamic line response characteristics**  
C.C mode

Ta = 25 °C

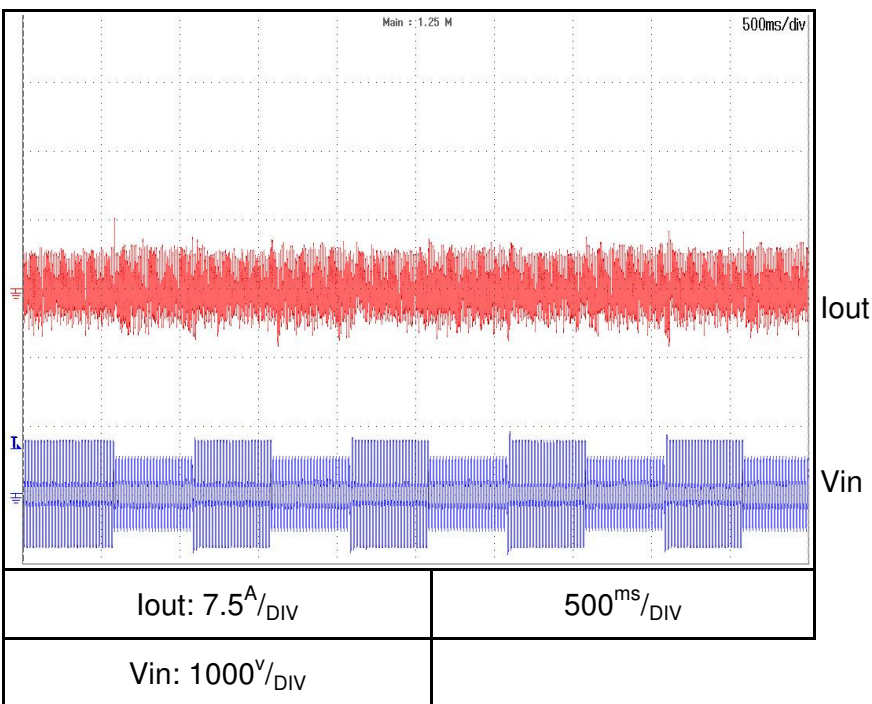
**GSP10-1500 3Φ200**

Conditions: Vout: 100%  
Iout: 100%  
Vin: 170↔265V



**GSP10-1500 3Φ480**

Conditions: Vout: 100%  
Iout: 100%  
Vin: 342↔520V



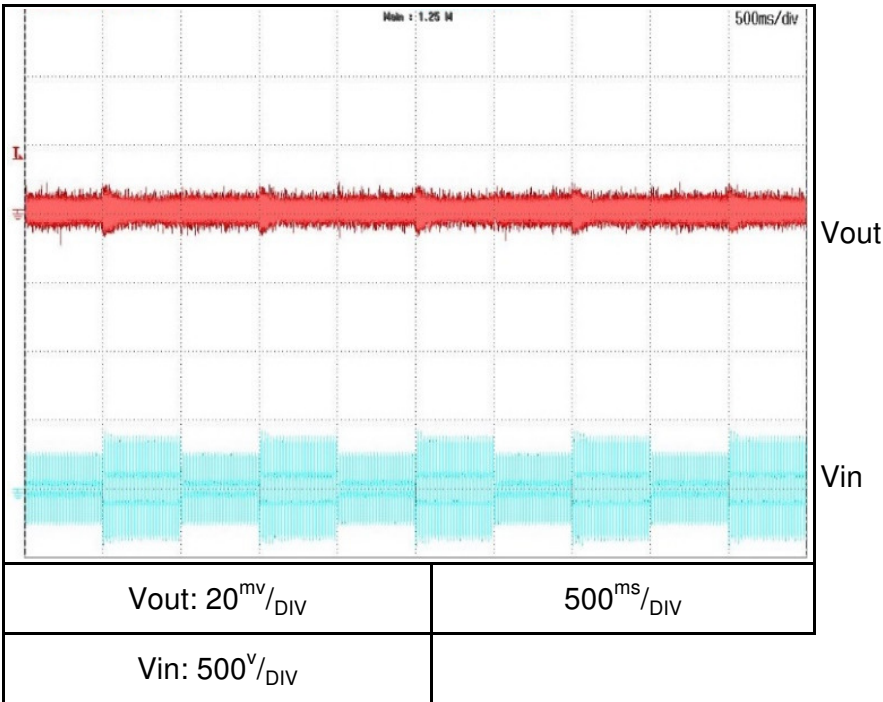
**2.7 Dynamic line response characteristics**

Ta = 25 °C

C.V mode

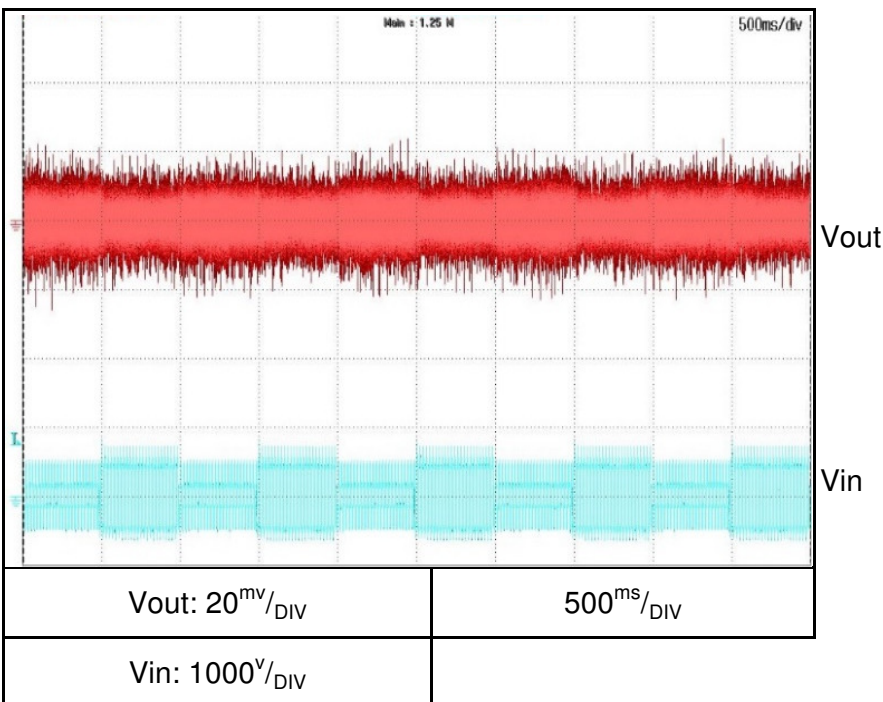
**GSP60-255 3Φ200**

Conditions: Vout: 100%  
Iout: 100%  
Vin: 170↔265V



**GSP60-255 3Φ400**

Conditions: Vout: 100%  
Iout: 100%  
Vin: 342↔520V



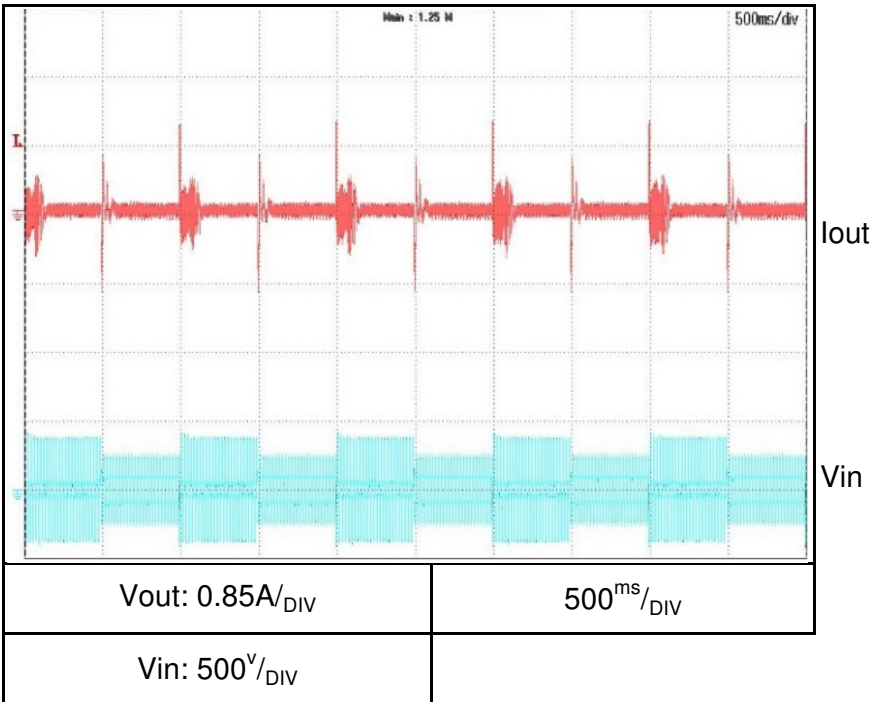
**2.7 Dynamic line response characteristics**

Ta = 25 °C

C.C mode

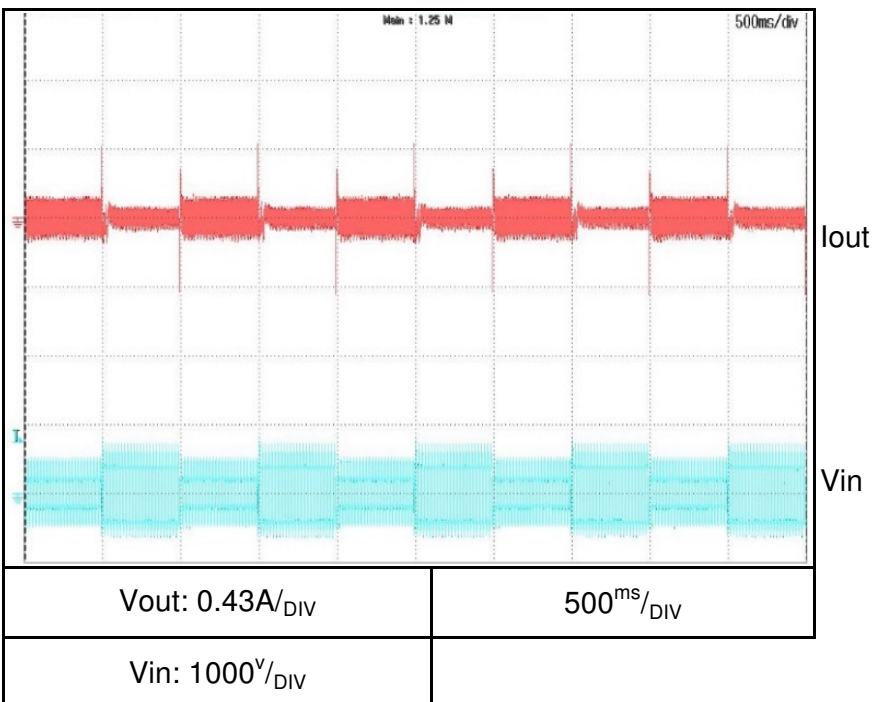
**GSP60-255 3Φ200**

Conditions: Vout: 100%  
Iout: 100%  
Vin: 170↔265V



**GSP60-255 3Φ400**

Conditions: Vout: 100%  
Iout: 100%  
Vin: 342↔520V

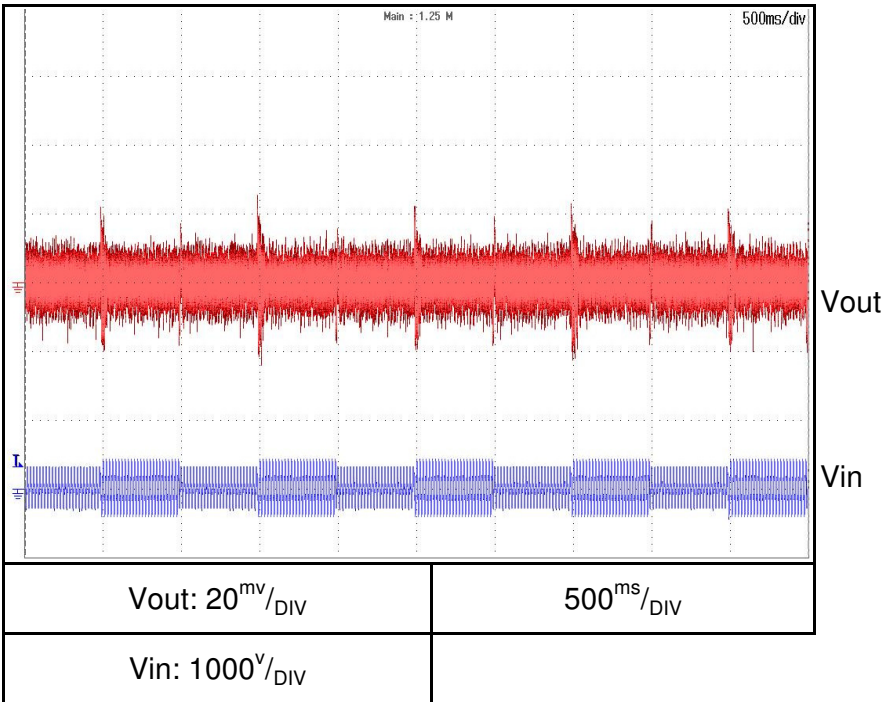


**2.7 Dynamic line response characteristics**

C.V mode

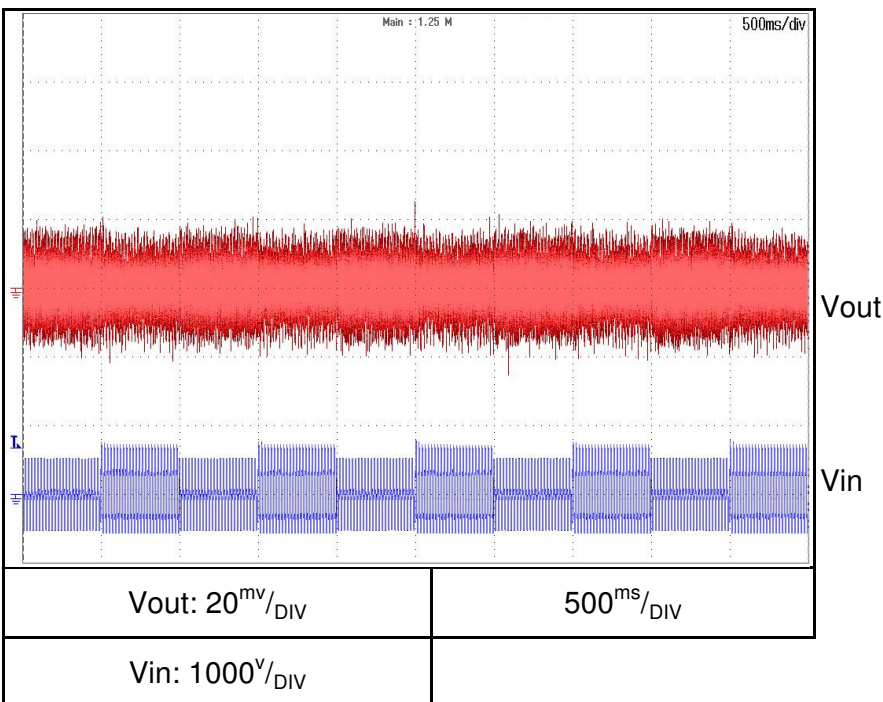
**GSP150-102 3Φ200**

Conditions: Vout: 100%  
Iout: 100%  
Vin: 170↔265V



**GSP150-102 3Φ400**

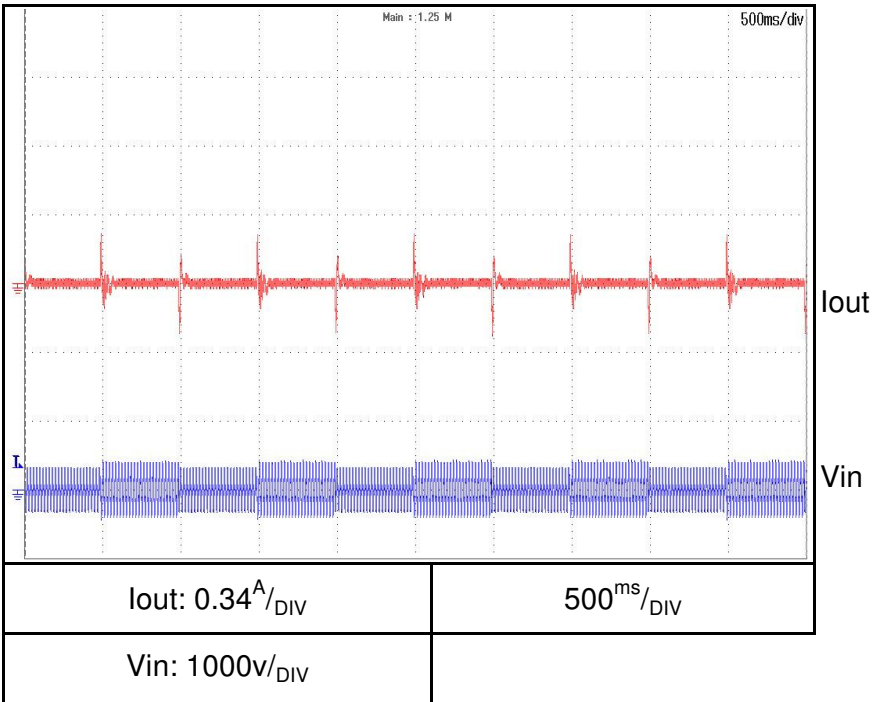
Conditions: Vout: 100%  
Iout: 100%  
Vin: 342↔520V



**2.7 Dynamic line response characteristics**  
C.C mode

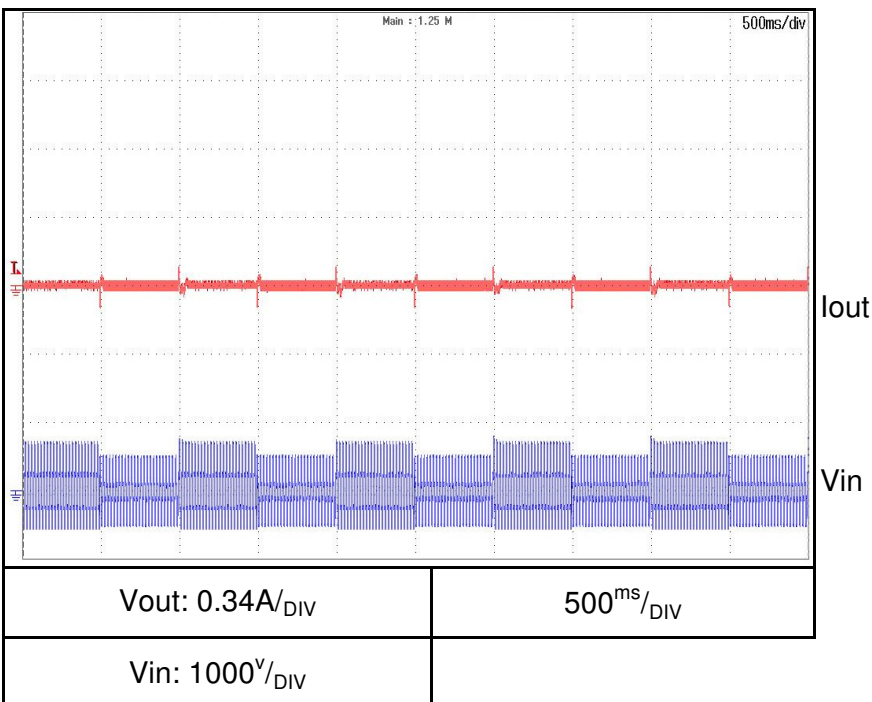
**GSP150-102 3Φ200**

Conditions: Vout: 100%  
Iout: 100%  
Vin: 170↔265V



**GSP150-102 3Φ400**

Conditions: Vout: 100%  
Iout: 100%  
Vin: 342↔520V





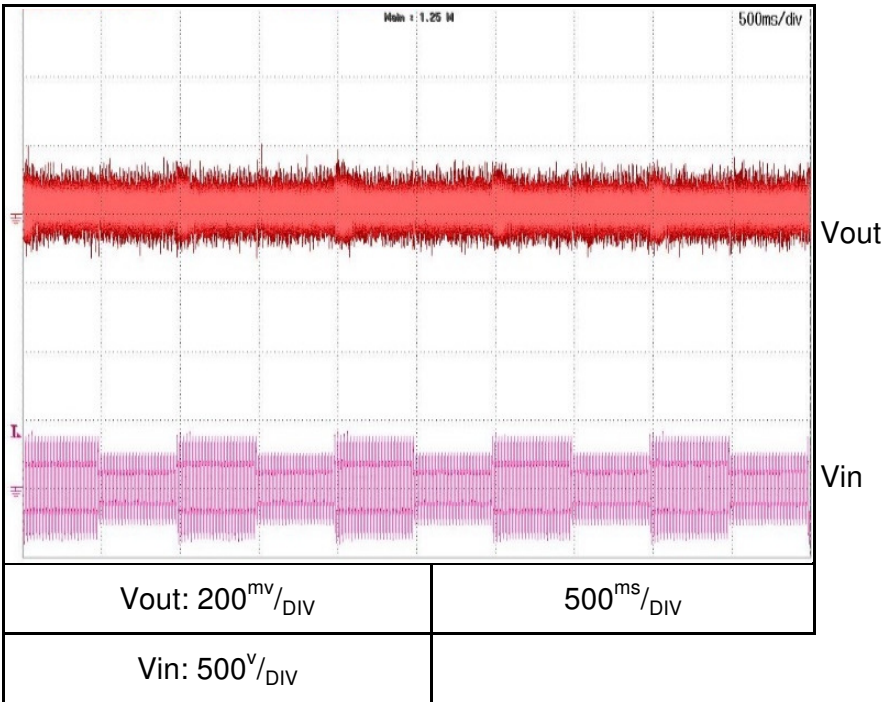
**2.7 Dynamic line response characteristics**

Ta = 25 °C

C.V mode

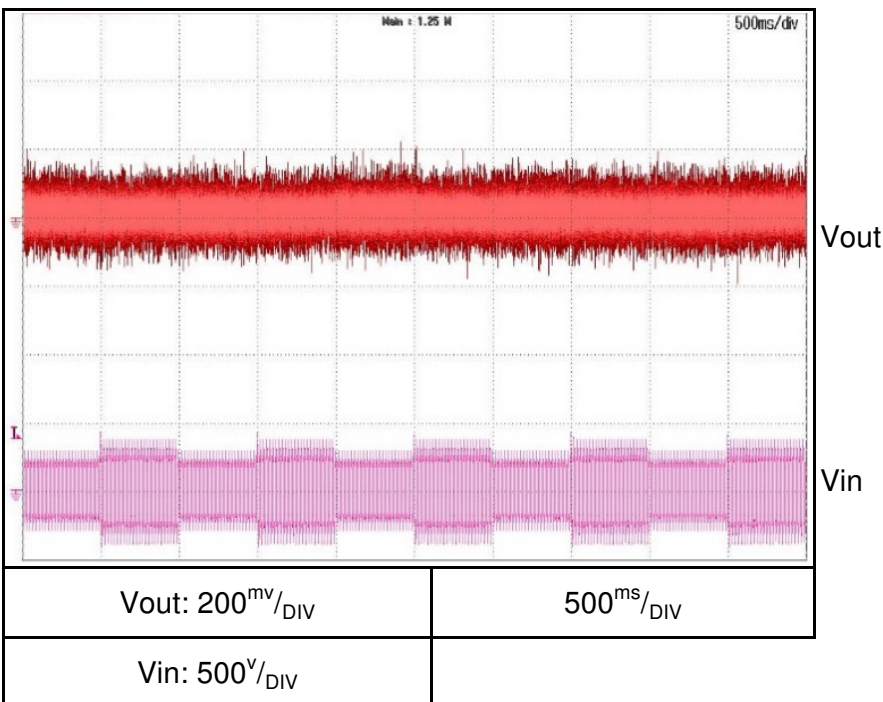
**GSP600-25.5 3Φ200**

Conditions: Vout: 100%  
Iout: 100%  
Vin: 170↔265V



**GSP600-25.5 3Φ400**

Conditions: Vout: 100%  
Iout: 100%  
Vin: 342↔460V



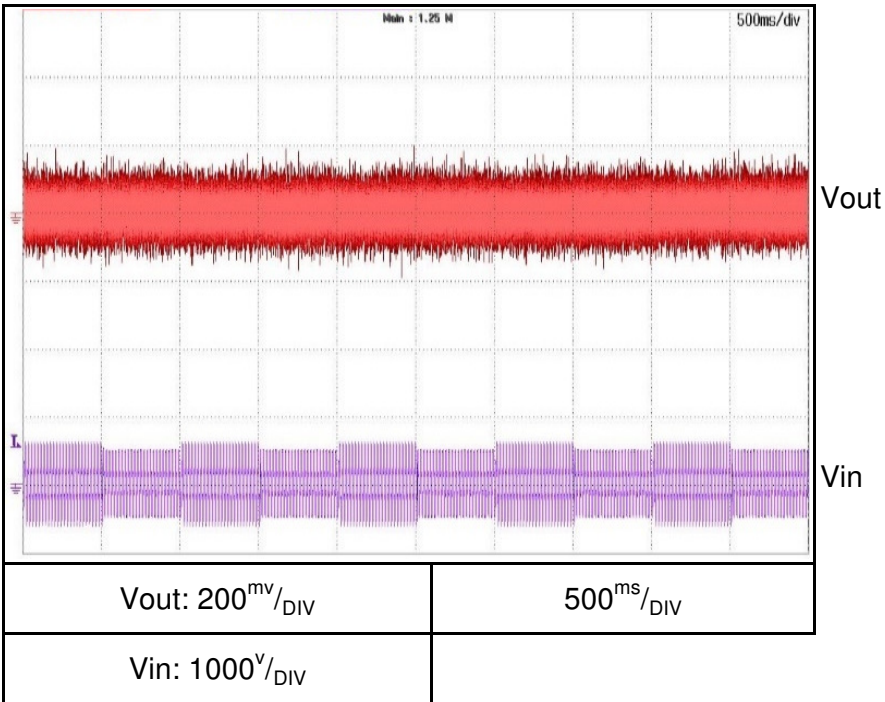
**2.7 Dynamic line response characteristics**

C.V mode

Ta = 25 °C

GSP600-25.5 3Φ480

Conditions: Vout: 100%  
Iout: 100%  
Vin: 342↔520V

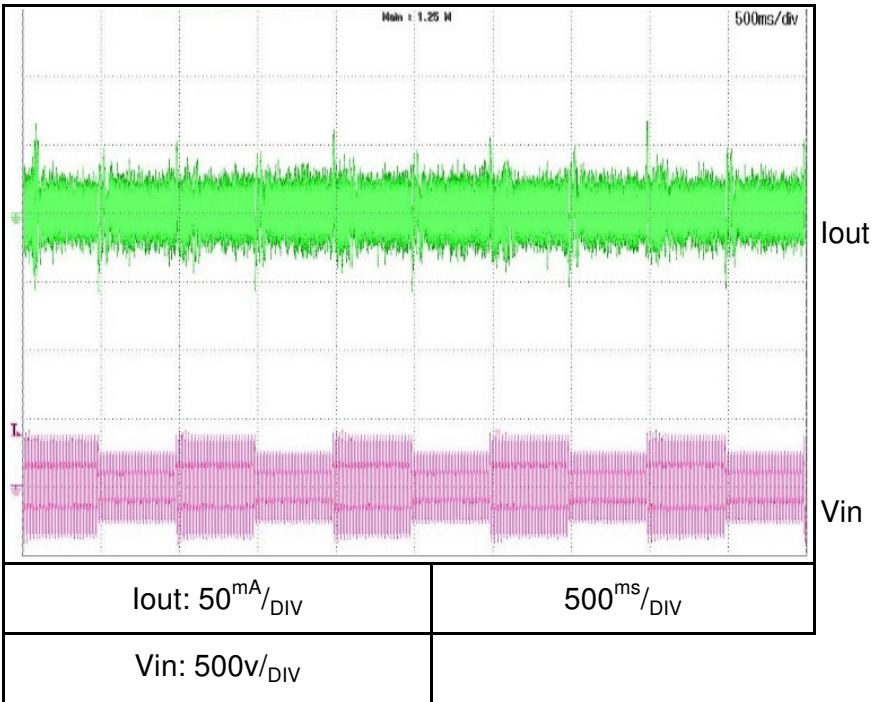


**2.7 Dynamic line response characteristics**  
C.C mode

Ta = 25 °C

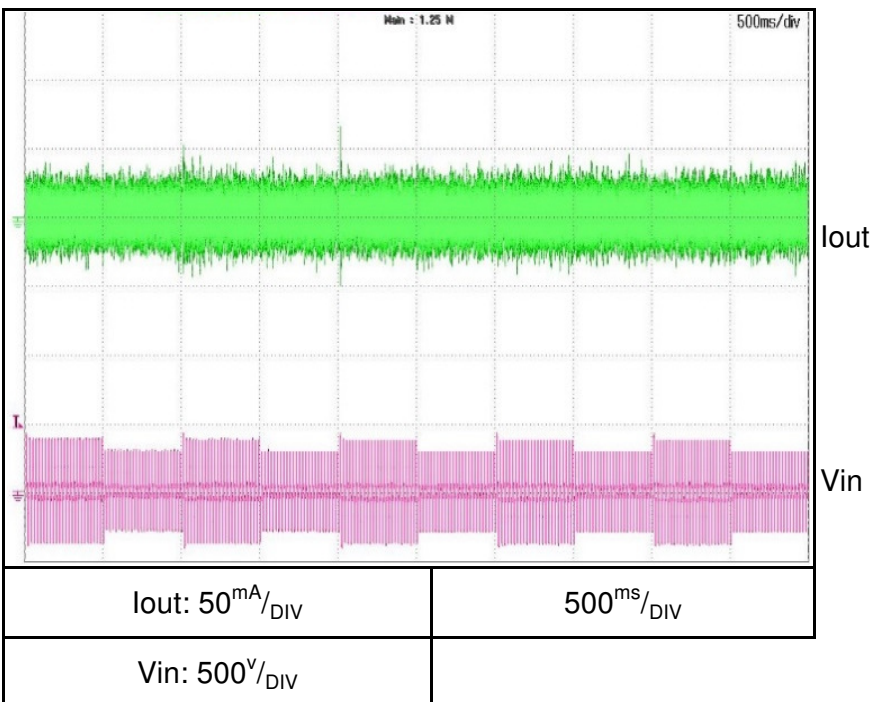
**GSP600-25.5 3Φ200**

Conditions: Vout: 100%  
Iout: 100%  
Vin: 170↔265V



**GSP600-25.5 3Φ400**

Conditions: Vout: 100%  
Iout: 100%  
Vin: 342↔460V



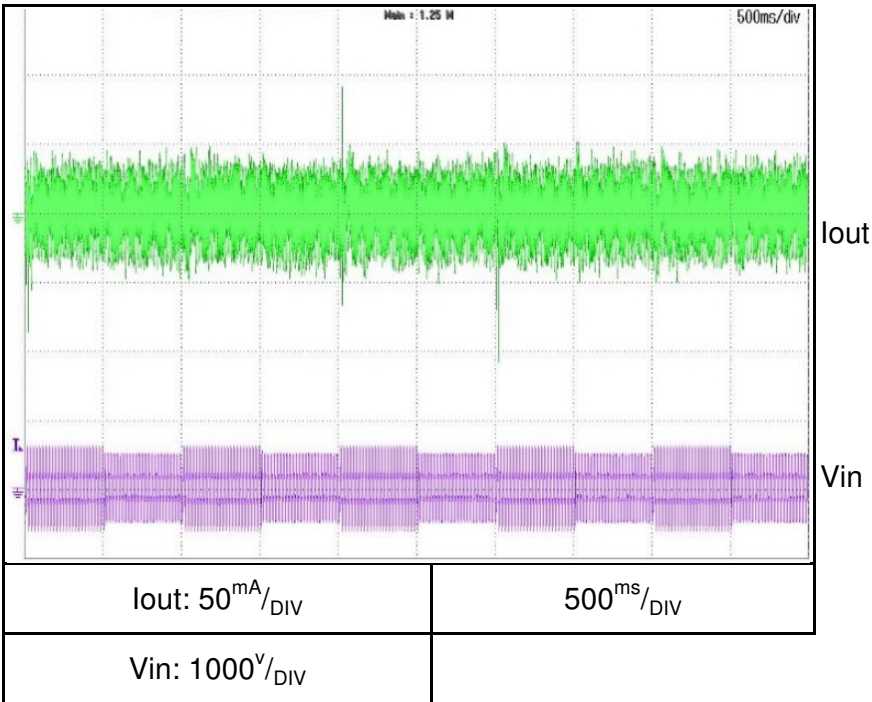


**2.7 Dynamic line response characteristics**  
C.C mode

Ta = 25 °C

GSP600-25.5 3Φ480

Conditions: Vout: 100%  
Iout: 100%  
Vin: 342↔520V

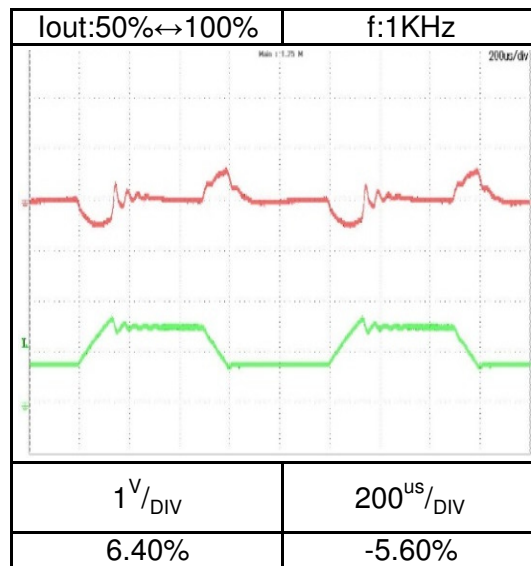
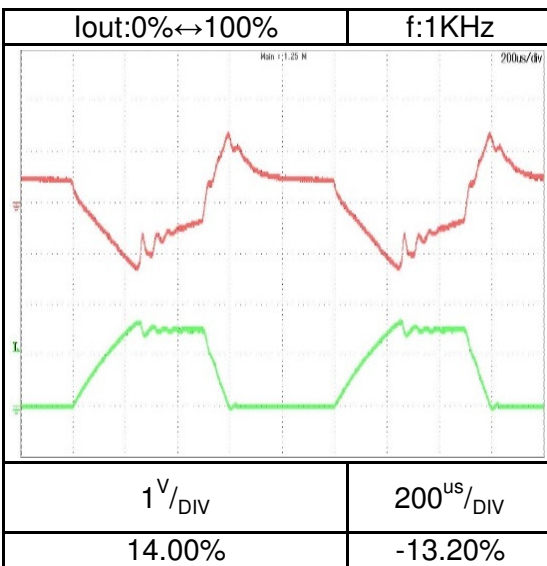
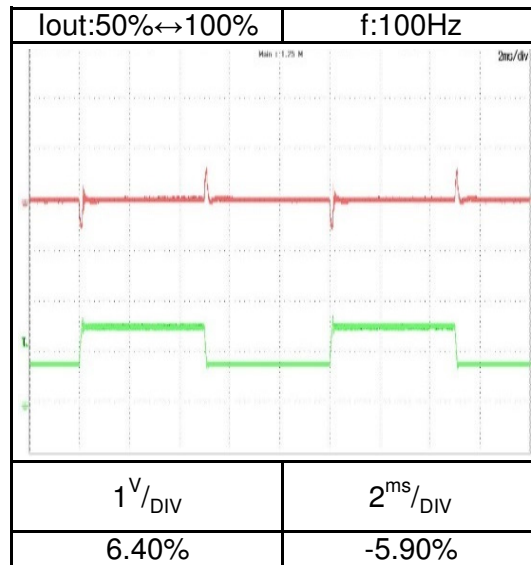
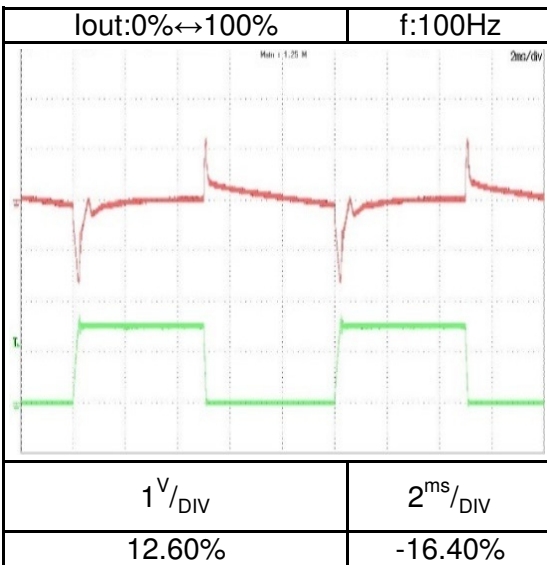


**2.8 Dynamic load response characteristics**  
C.V mode

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

Load current: tr=tf=100us

**GSP10-1500**

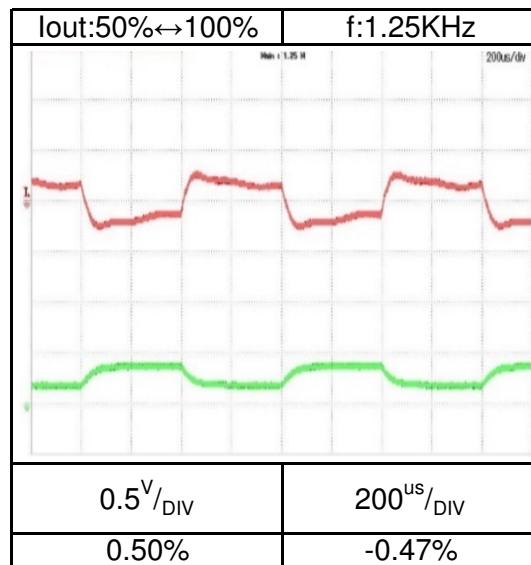
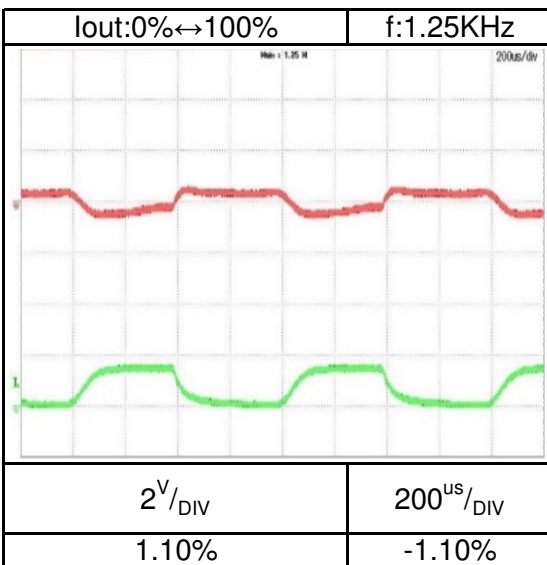
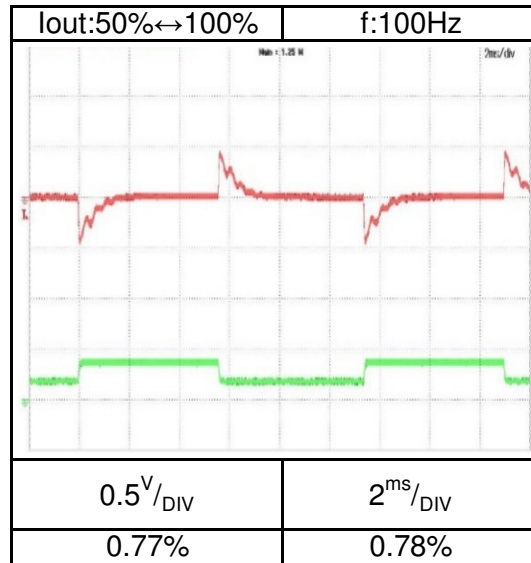
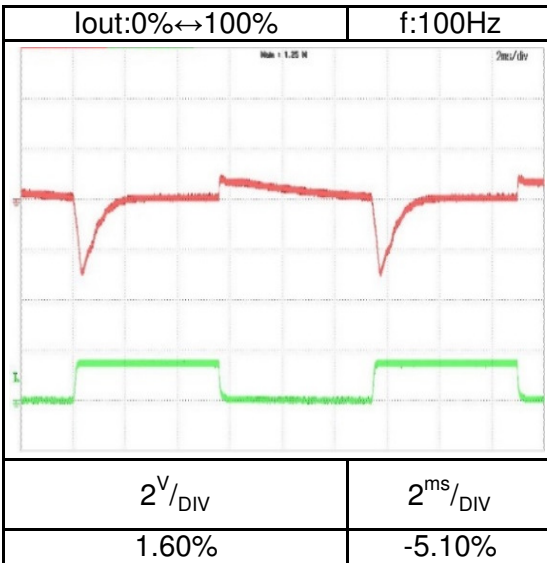


**2.8 Dynamic load response characteristics**  
C.V mode

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

Load current: tr=tf=100us

**GSP60-255**

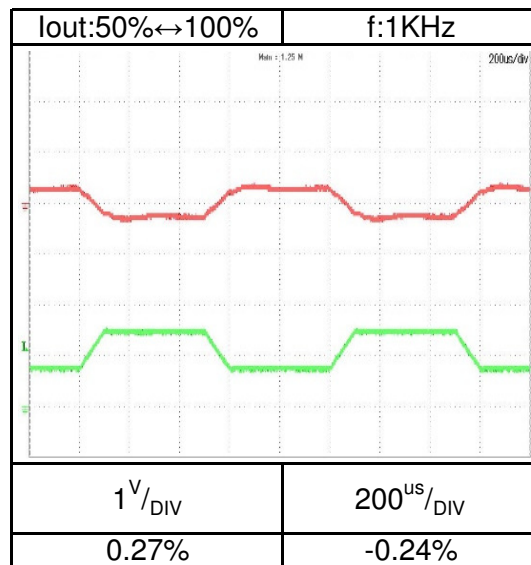
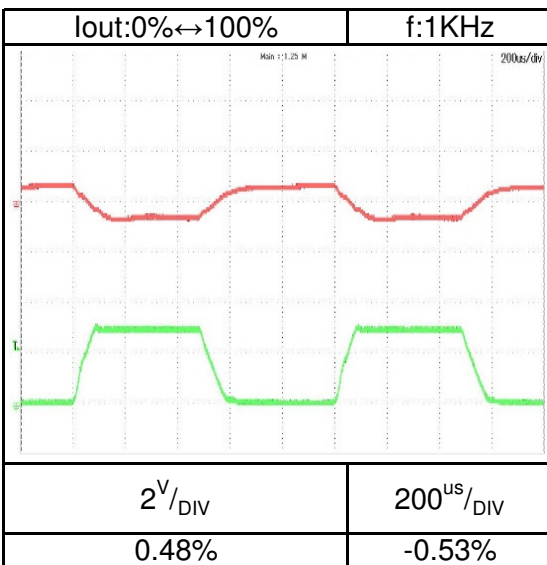
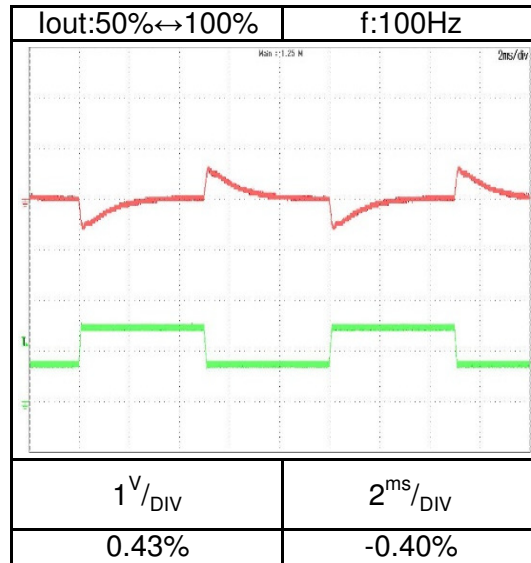
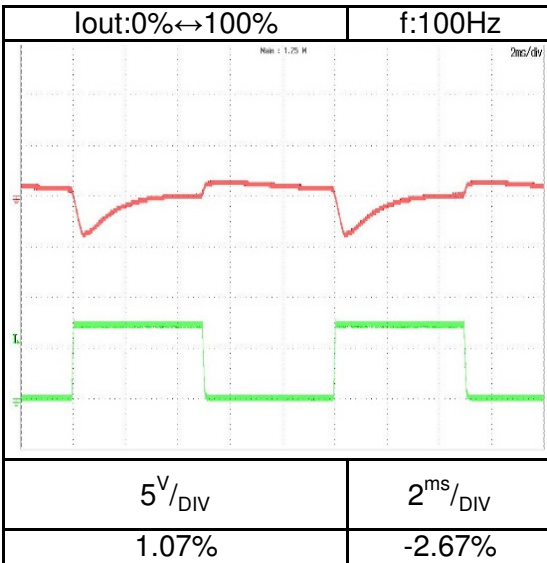


**2.8 Dynamic load response characteristics**  
C.V mode

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

Load current: tr=tf=100us

**GSP150-102**

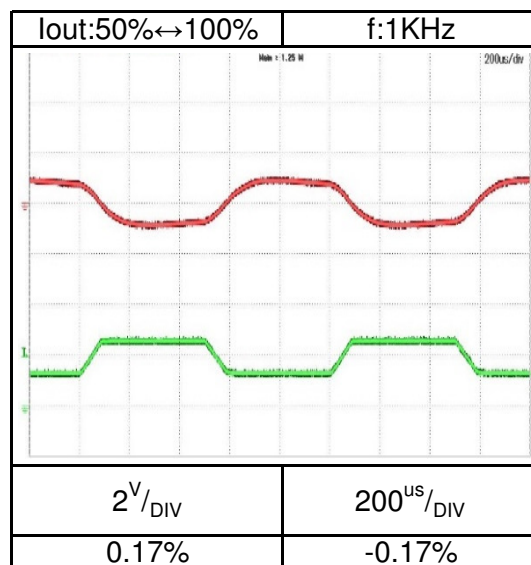
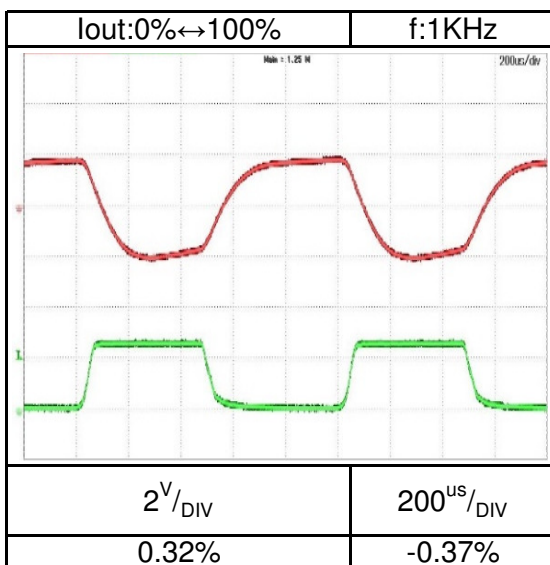
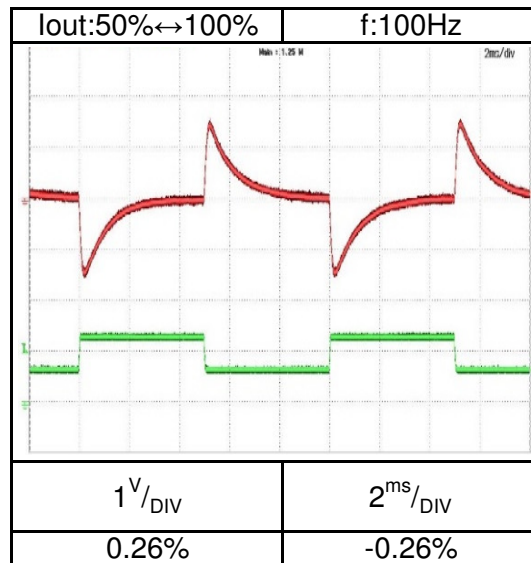
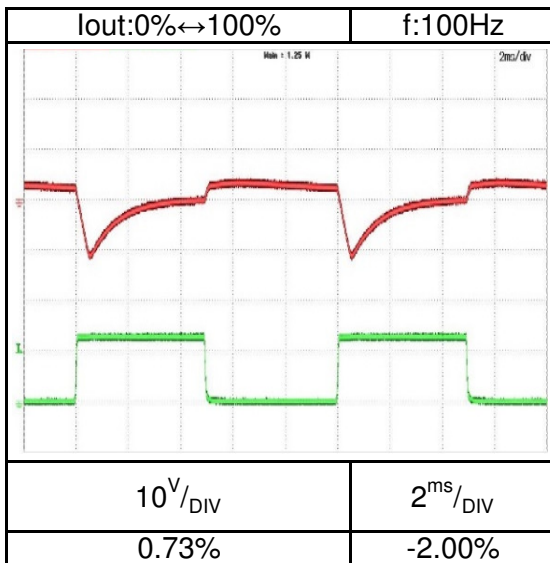


**2.8 Dynamic load response characteristics**  
C.V mode

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

Load current: tr=tf=100us

**GSP600-25.5**

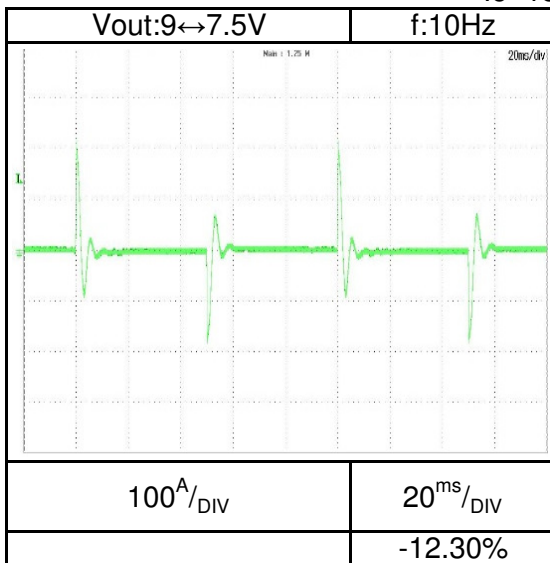


**2.8 Dynamic load response characteristics**  
C.C mode

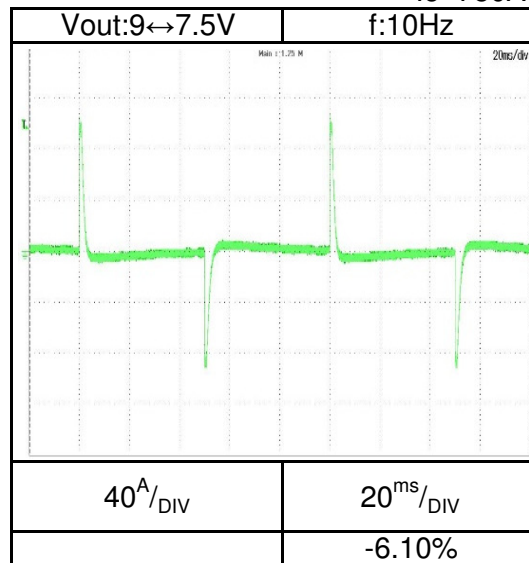
Conditions: Vin: Nominal  
Ta = 25°C

**GSP10-1500**

Io=1500A

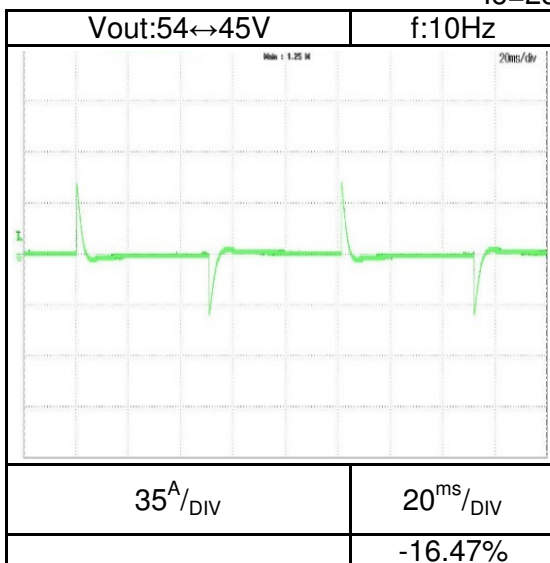


Io=750A

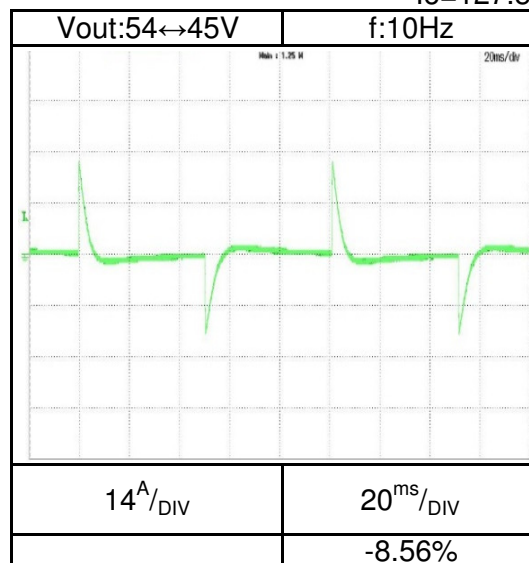


**GSP60-255**

Io=255A



Io=127.5A



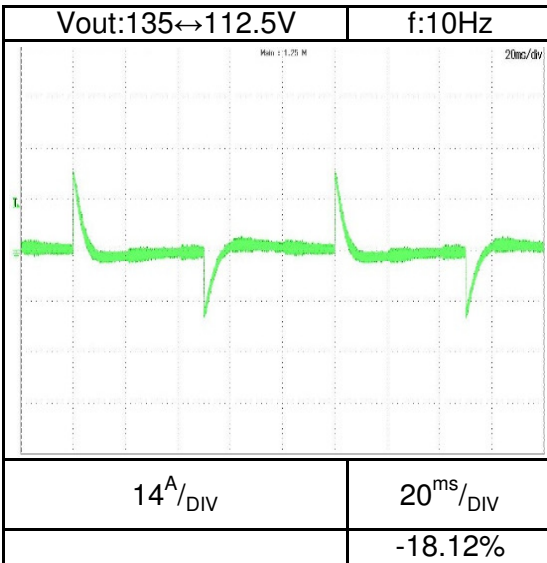


**2.8 Dynamic load response characteristics**  
C.C mode

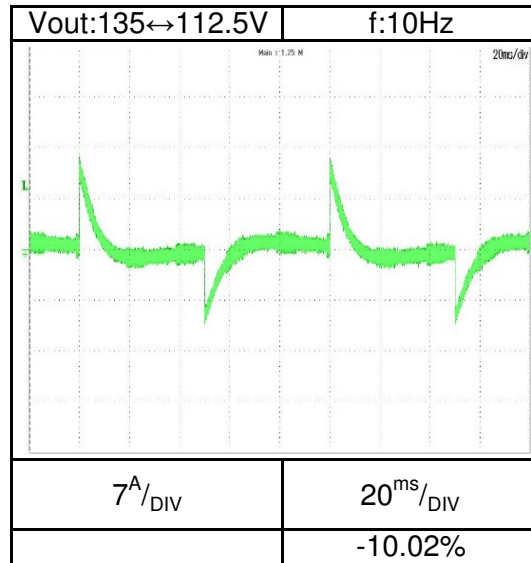
Conditions: Vin: Nominal  
Ta = 25°C

**GSP150-102**

Io=102A

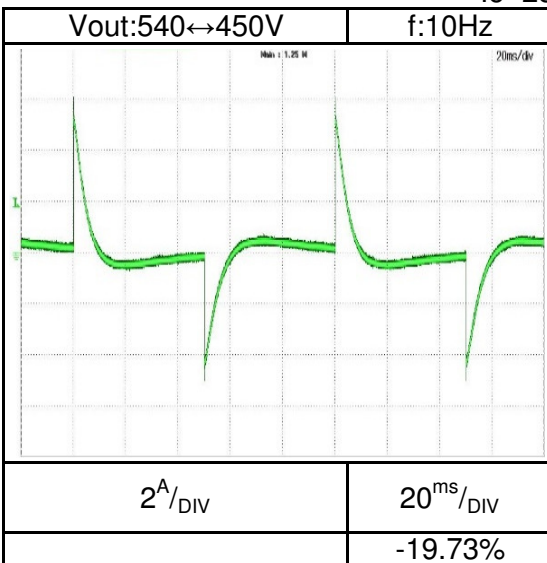


Io=51A

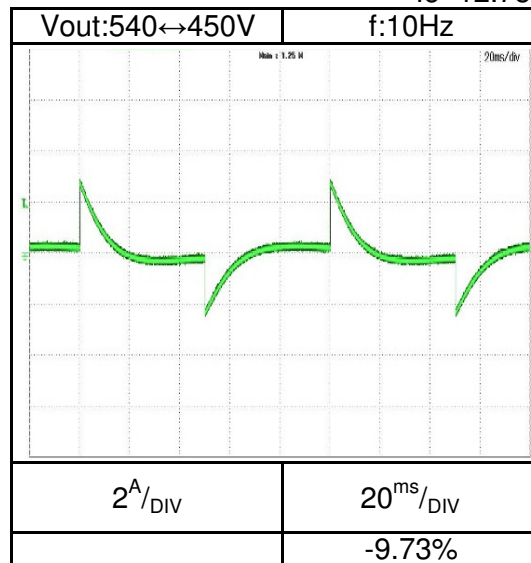


**GSP600-25.5**

Io=25.5A



Io=12.75A

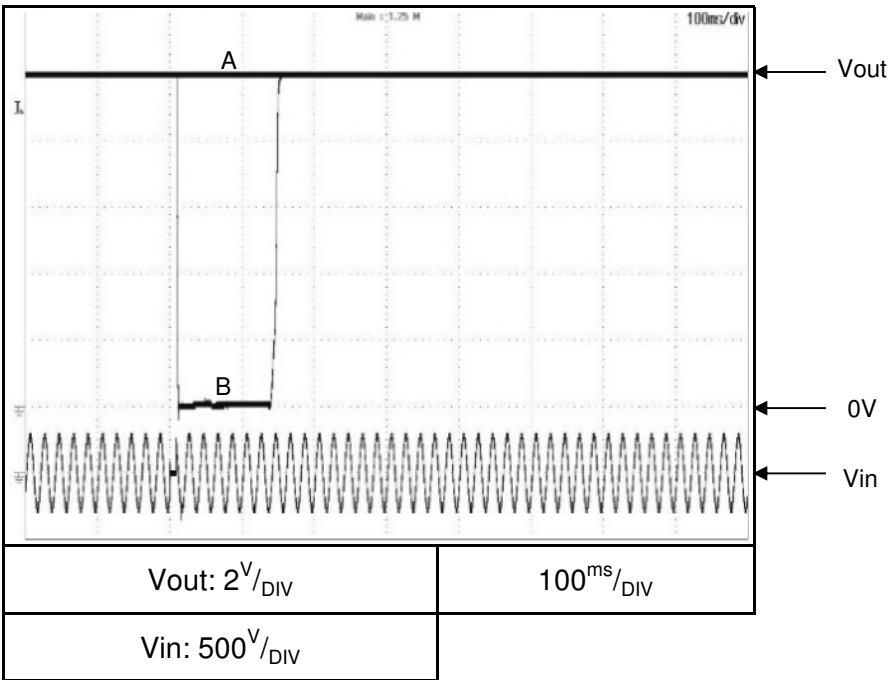


**2.9 Response to brown-out characteristics**  
C.V mode

Conditions: Vout: 100%  
Iout: 1400A  
Ta = 25°C

**GSP10-1500 3Φ200**

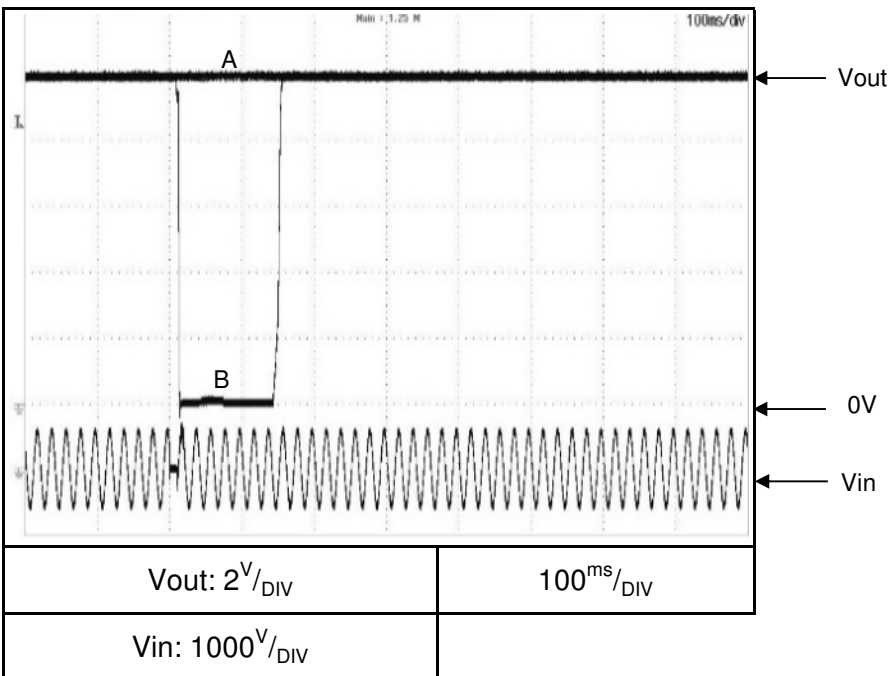
Vin:200VAC



Brown-out time  
A - 8ms  
B - 9ms

**GSP10-1500 3Φ400**

Vin:400VAC



Brown-out time  
A - 9ms  
B - 11ms

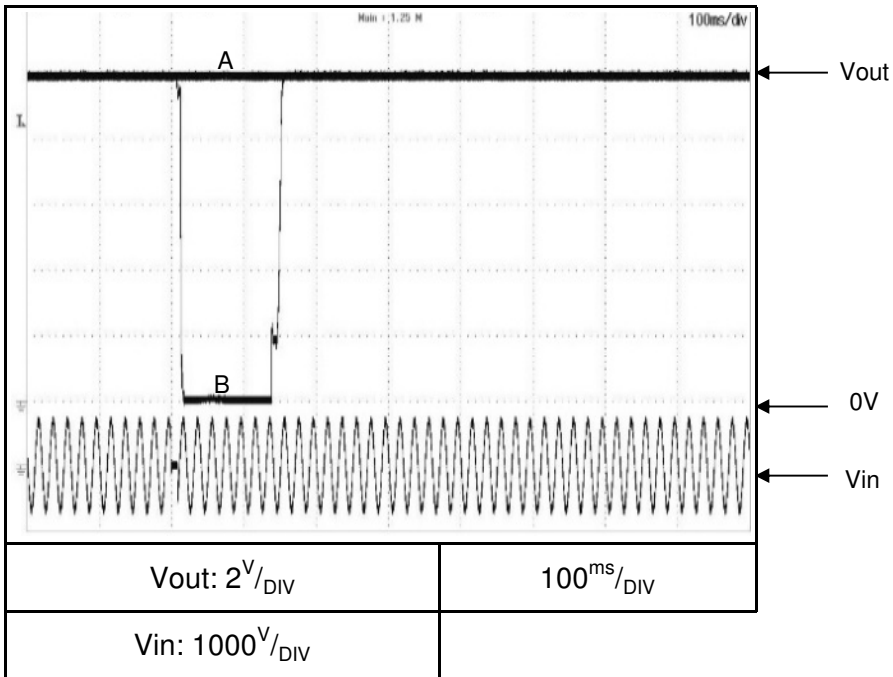


**2.9 Response to brown-out characteristics**  
C.V mode

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

GSP10-1500 3Φ480

Vin:480VAC



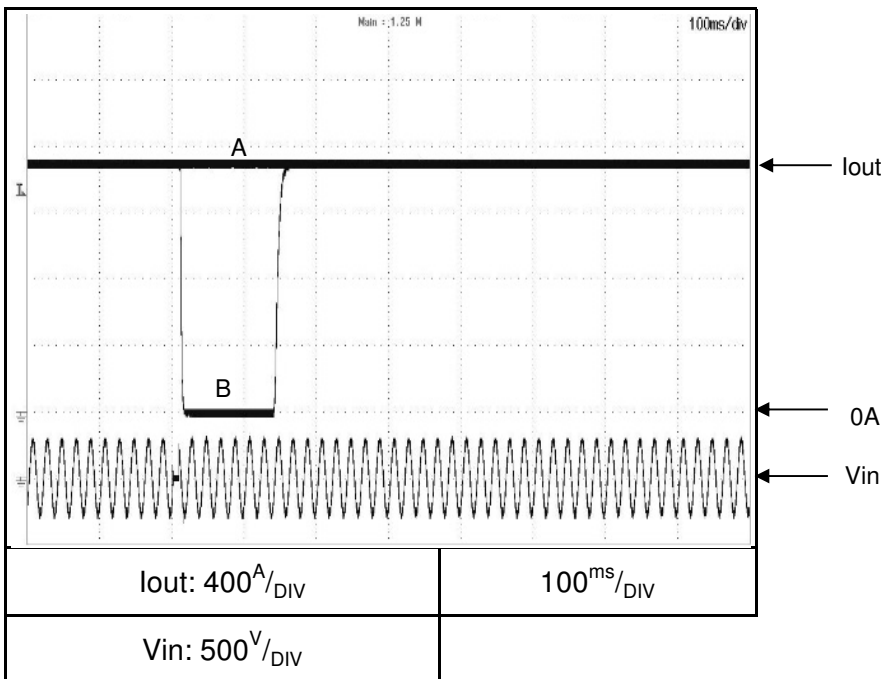
Brown-out time  
A - 7ms  
B - 9ms

**2.9 Response to brown-out characteristics**  
C.C mode

Conditions:  $V_{out}: 9V$   
 $I_{out}: 100\%$   
 $T_a = 25^\circ C$

**GSP10-1500 3 $\Phi$ 200**

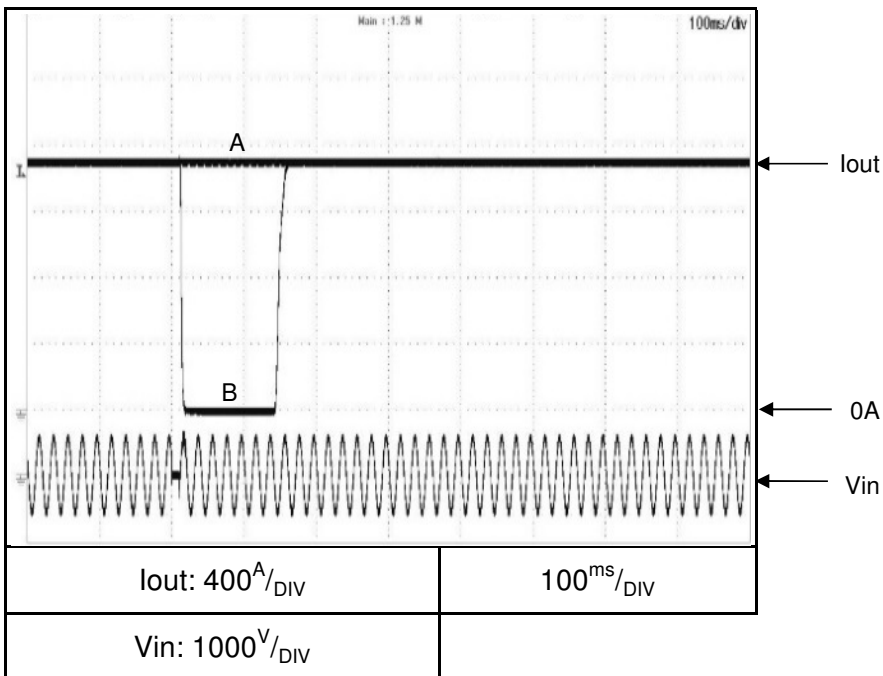
$V_{in}: 200VAC$



Brown-out time  
A - 8ms  
B - 9ms

**GSP10-1500 3 $\Phi$ 400**

$V_{in}: 400VAC$



Brown-out time  
A - 3ms  
B - 10ms

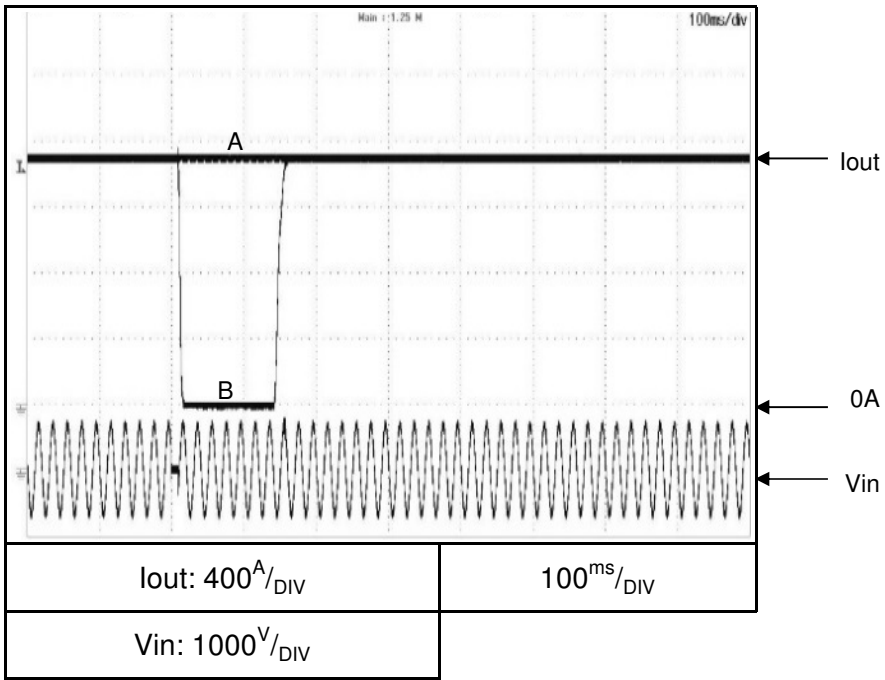
**2.9 Response to brown-out characteristics**  
C.C mode

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

GSP10-1500 3Φ480

Vin:480VAC

Brown-out time  
A - 3ms  
B - 10ms

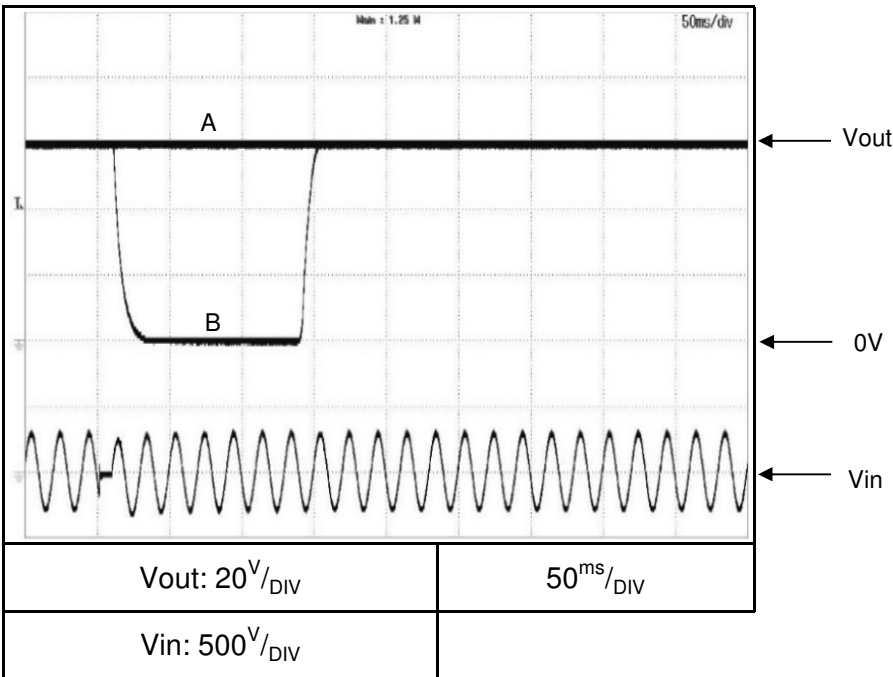


**2.9 Response to brown-out characteristics**  
C.V mode

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

**GSP60-255 3Φ200**

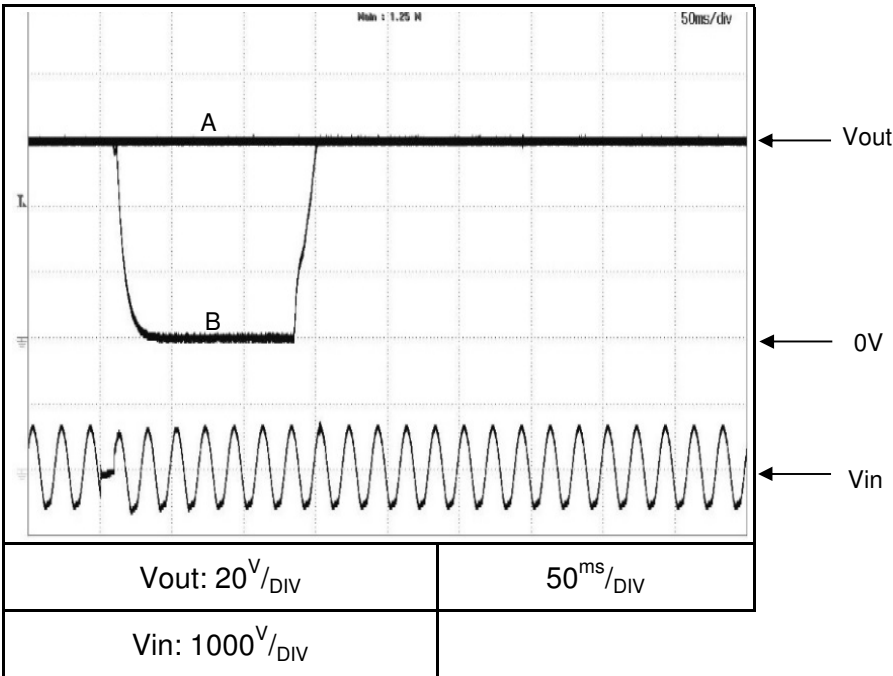
Vin:200VAC



Brown-out time  
A - 8ms  
B - 9ms

**GSP60-255 3Φ480**

Vin:480VAC



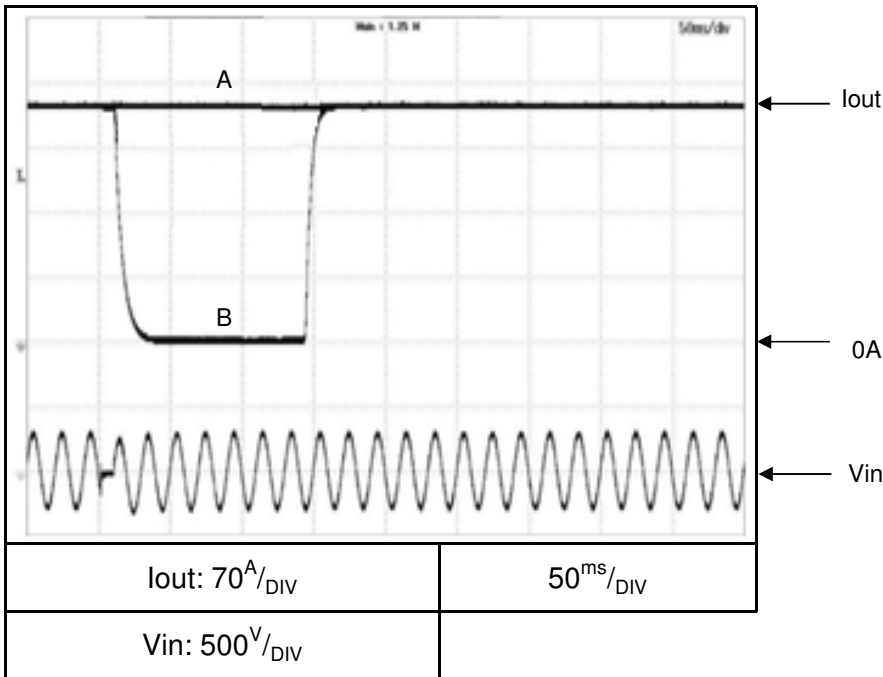
Brown-out time  
A - 8ms  
B - 9ms

**2.9 Response to brown-out characteristics**  
C.C mode

Conditions:  $V_{out}$ : 100%  
 $I_{out}$ : 100%  
 $T_a = 25^\circ\text{C}$

**GSP60-255 3 $\Phi$ 200**

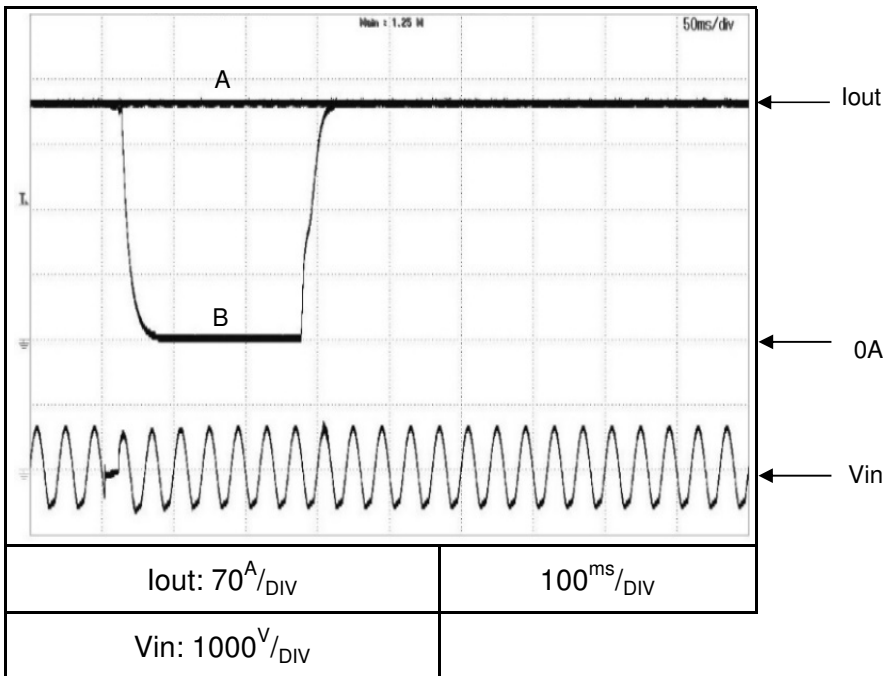
$V_{in}$ : 200VAC



Brown-out time  
A - 8ms  
B - 9ms

**GSP60-255 3 $\Phi$ 480**

$V_{in}$ : 480VAC



Brown-out time  
A - 8ms  
B - 9ms

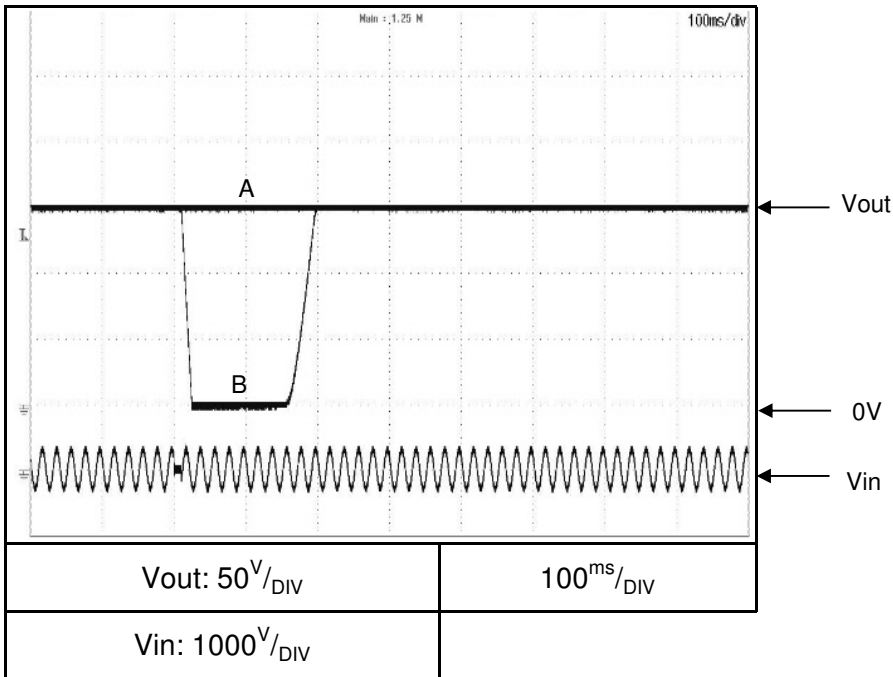
**2.9 Response to brown-out characteristics**  
C.V mode

Conditions: Vout: 100%  
Ta = 25°C

**GSP150-102 3Φ200**

Vin:200VAC  
Iout: 90A

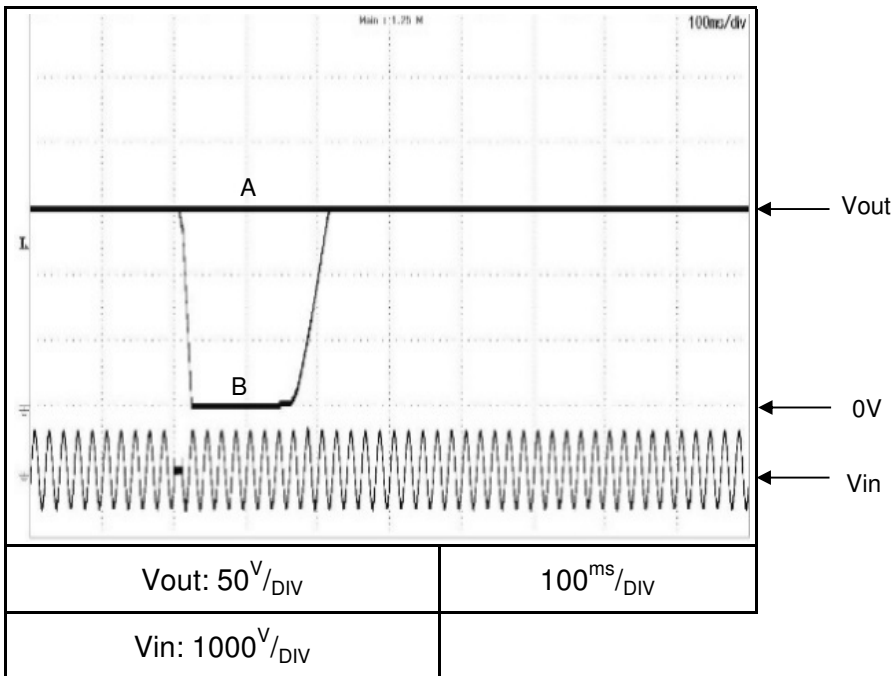
Brown-out time  
A - 9ms  
B - 10ms



**GSP150-102 3Φ400**

Vin:400VAC  
Iout: 95A

Brown-out time  
A - 10ms  
B - 11ms

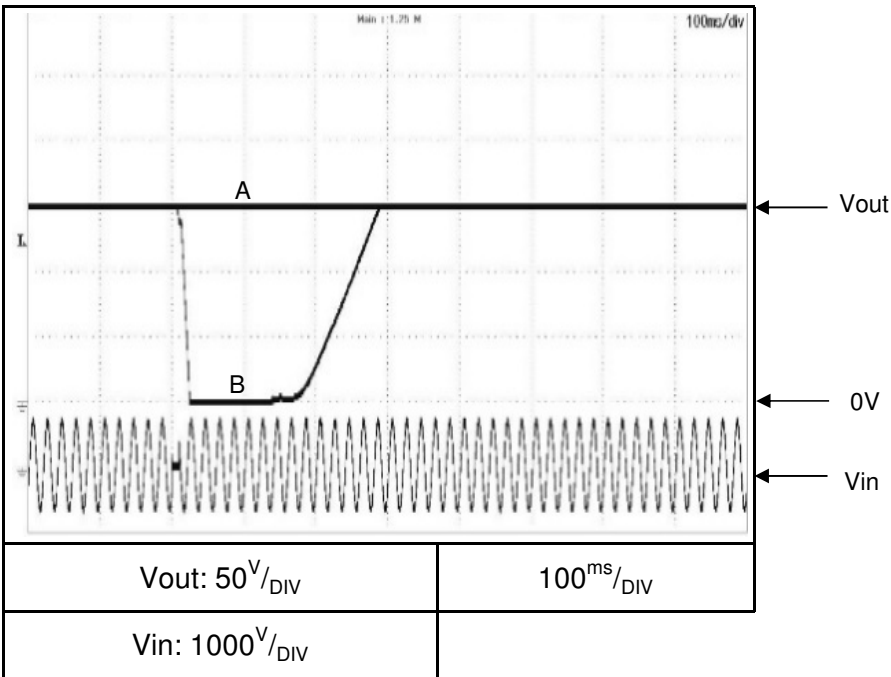


**2.9 Response to brown-out characteristics**  
C.V mode

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

GSP150-102 3Φ480

Vin:480VAC



Brown-out time  
A - 9ms  
B - 10ms

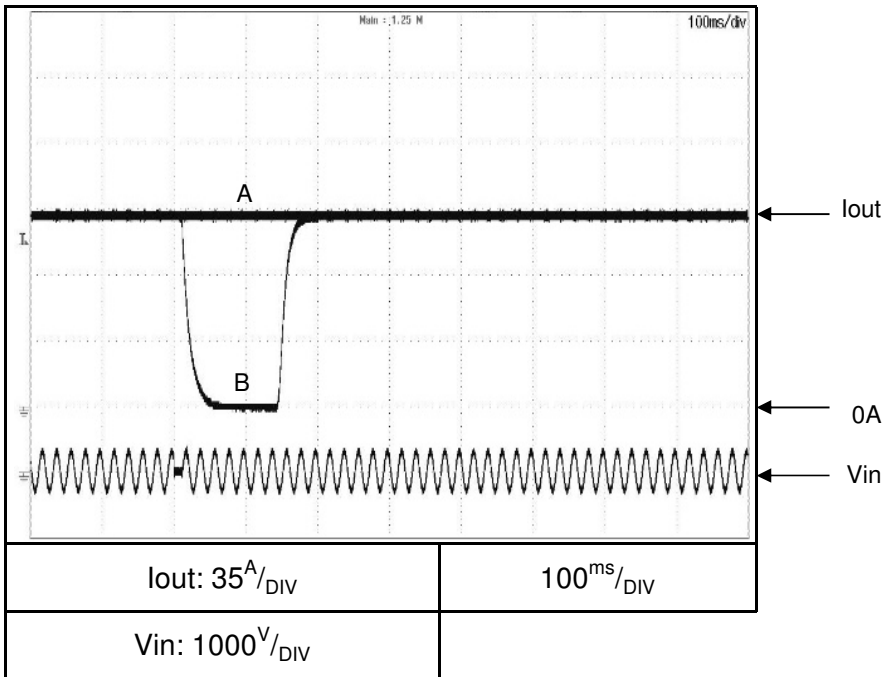
**2.9 Response to brown-out characteristics**  
C.C mode

Conditions: Iout: 100%  
Ta = 25°C

Vin: 200VAC  
\*Vout: 126V

Brown-out time  
A - 10ms  
B - 11ms

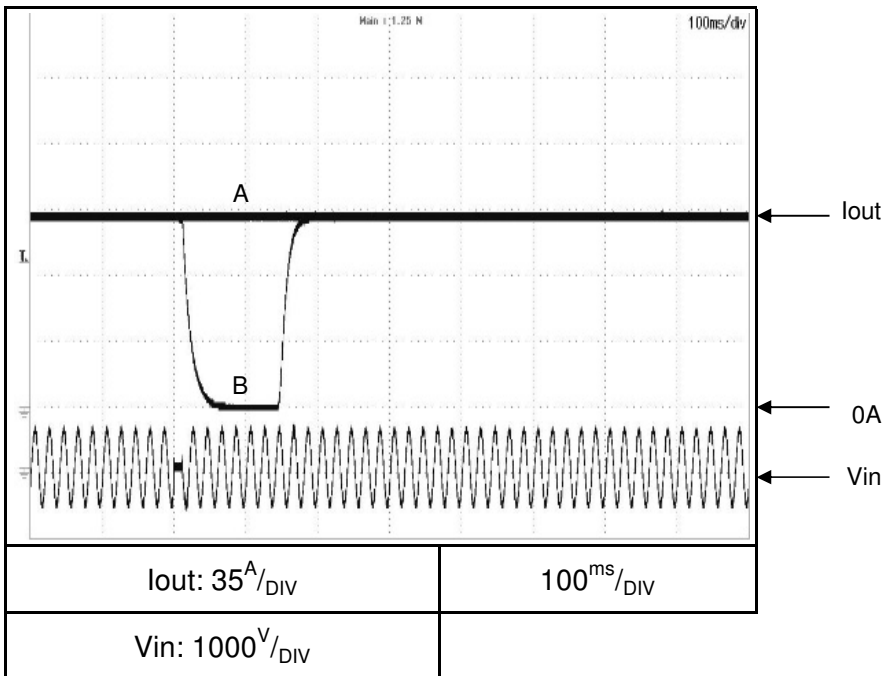
**GSP150-102 3Φ200**



**GSP150-102 3Φ400**

Vin: 400VAC  
\*Vout: 134V

Brown-out time  
A - 10ms  
B - 11ms



\*Equipment limitation



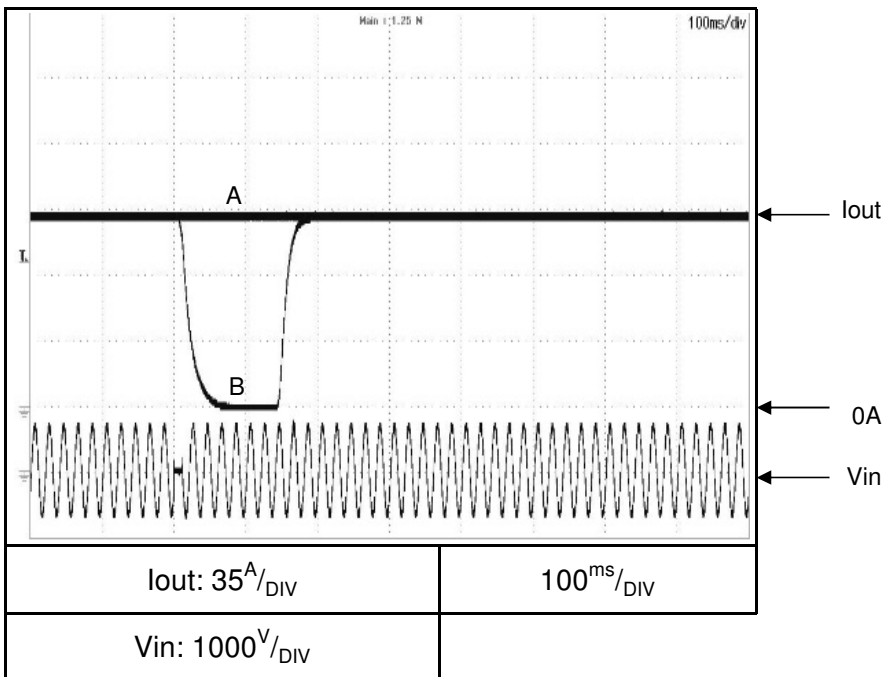
**2.9 Response to brown-out characteristics**  
C.C mode

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

GSP150-102 3Φ480

Vin:480VAC

Brown-out time  
A - 10ms  
B - 11ms



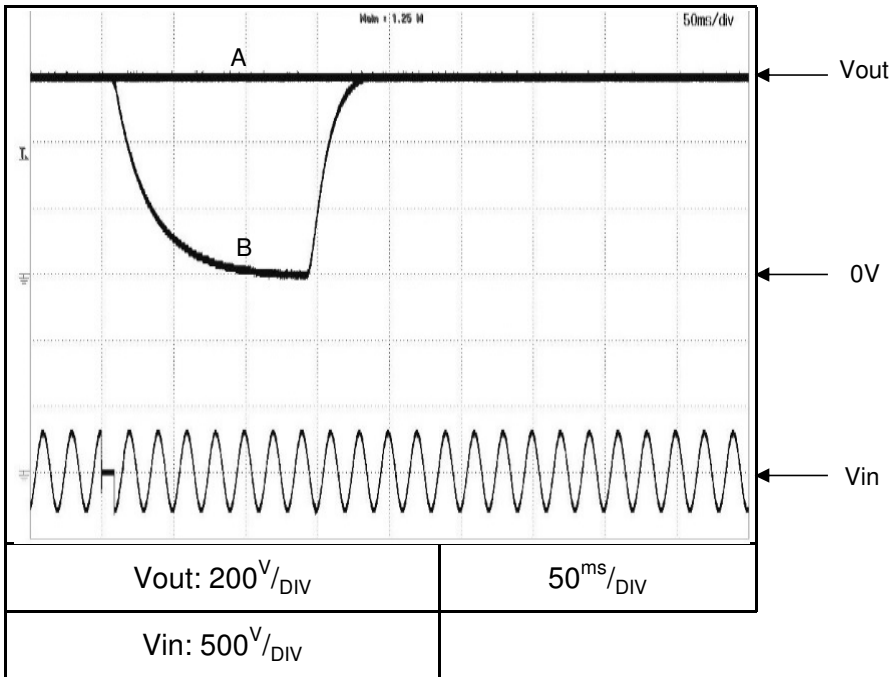
**2.9 Response to brown-out characteristics**  
C.V mode

Conditions:

Vout: 100%  
Iout: 100%  
Ta = 25°C

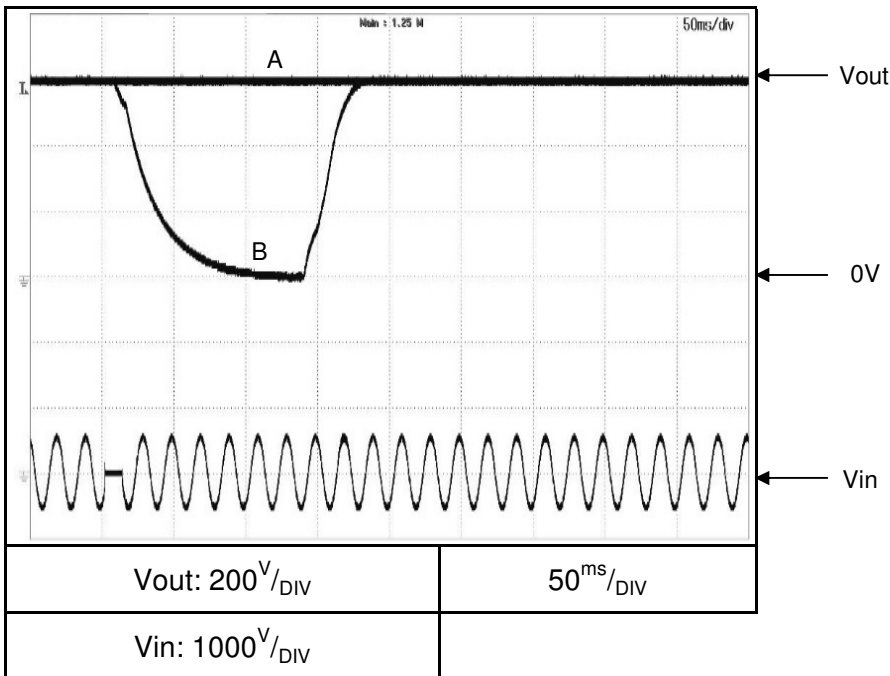
**GSP600-25.5 3Φ200**

Vin:208VAC



**GSP600-25.5 3Φ400**

Vin:415VAC



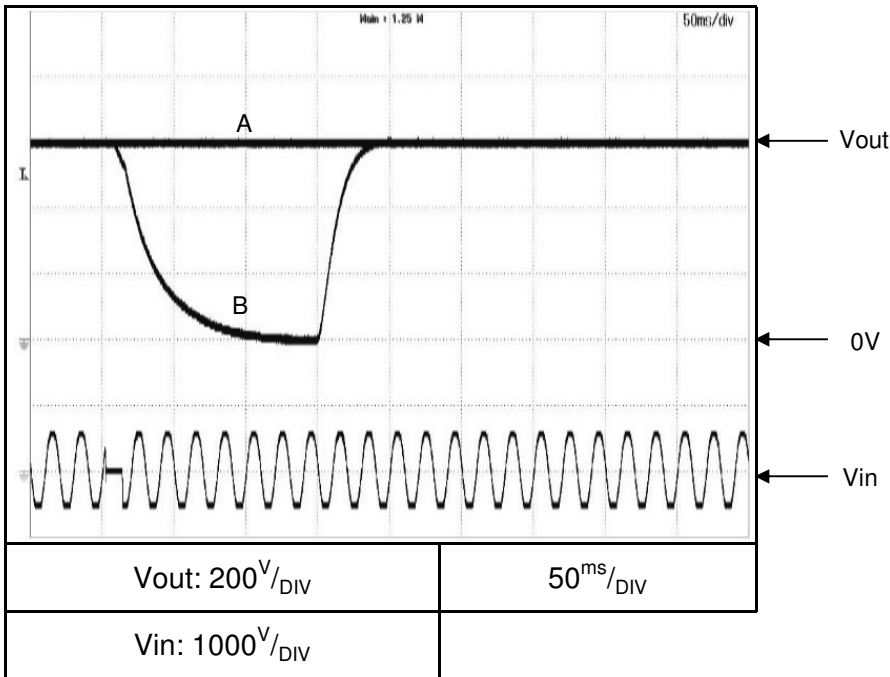
**2.9 Response to brown-out characteristics**  
C.V mode

Conditions:

Vout: 100%  
Iout: 100%  
Ta = 25°C

GSP600-25.5 3Φ480

Vin:480VAC



Brown-out time  
A - 6ms  
B - 12ms

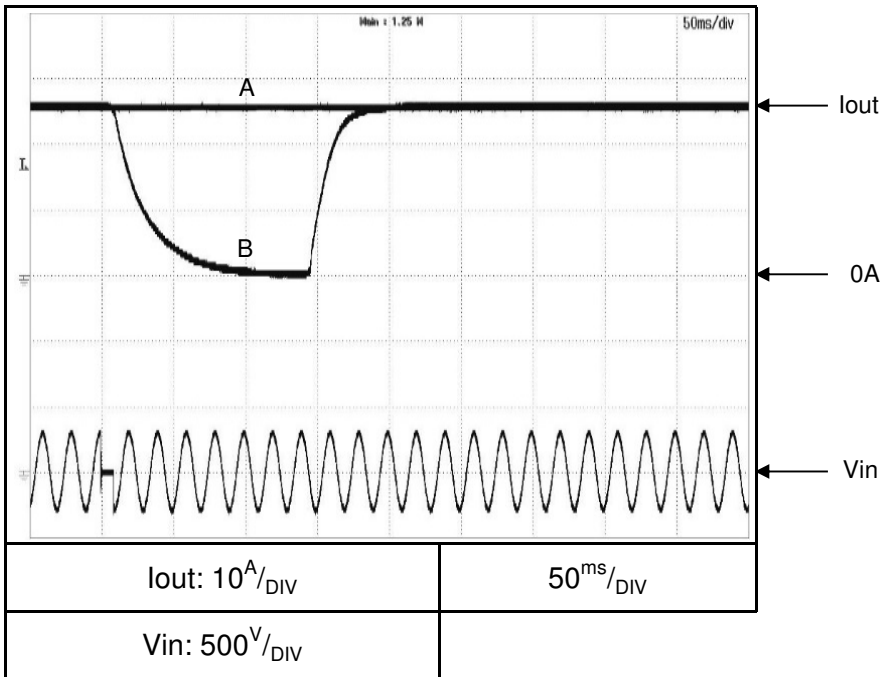
**2.9 Response to brown-out characteristics**  
C.C mode

Conditions:

Vout: 100%  
Iout: 100%  
Ta = 25°C

**GSP600-25.5 3Φ200**

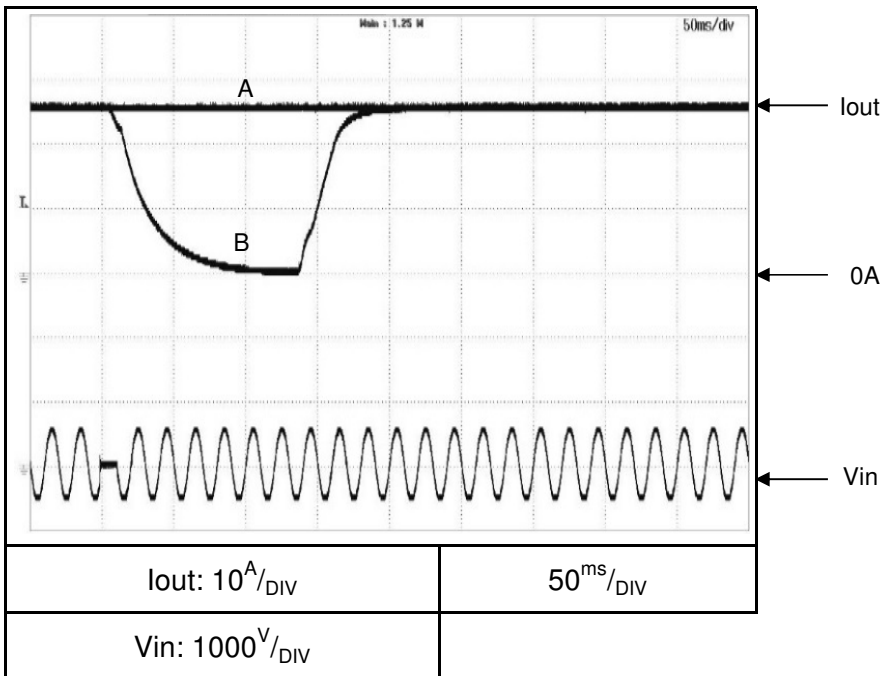
Vin:208VAC



Brown-out time  
A - 8ms  
B - 9ms

**GSP600-25.5 3Φ400**

Vin:415VAC



Brown-out time  
A - 7ms  
B - 12ms

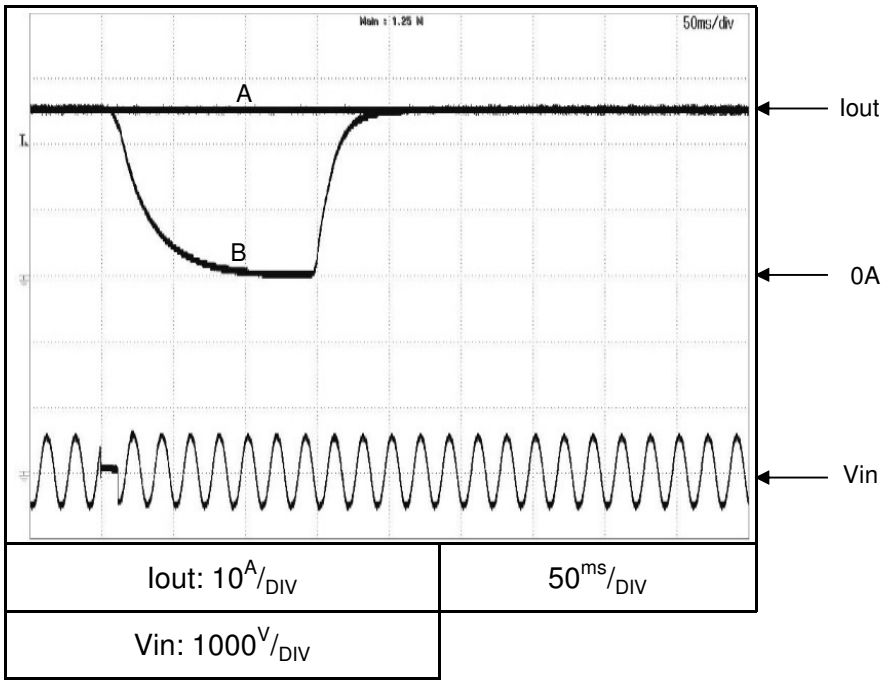
**2.9 Response to brown-out characteristics**  
C.C mode

Conditions:

Vout: 100%  
Iout: 100%  
Ta = 25°C

GSP600-25.5 3Φ480

Vin:480VAC



Brown-out time  
A - 7ms  
B - 12ms

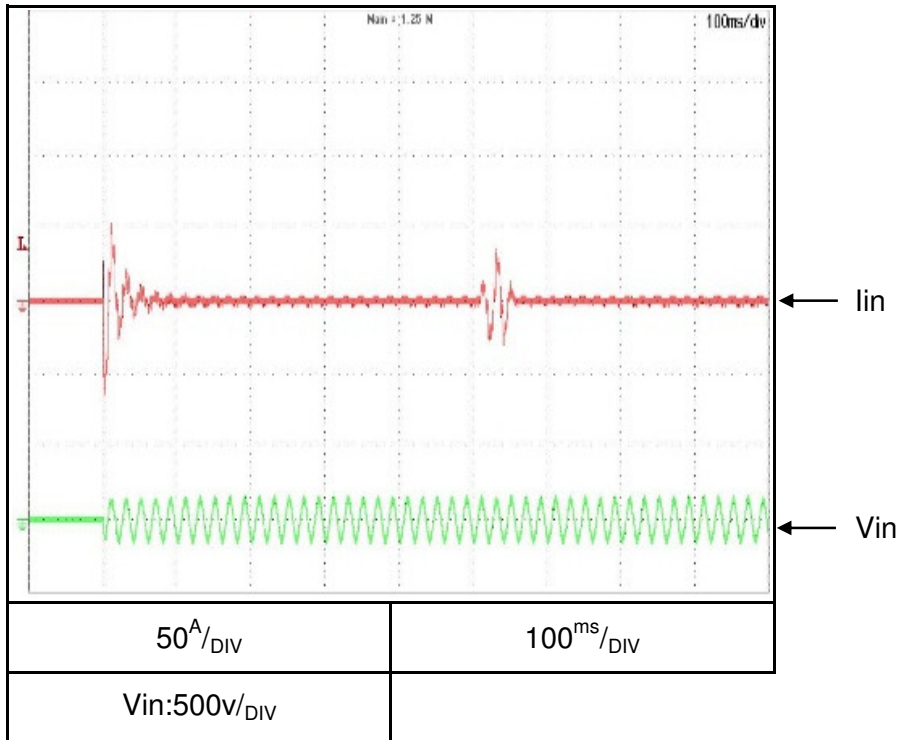
**2.10 Inrush current waveform**

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

**3Φ200 Input**

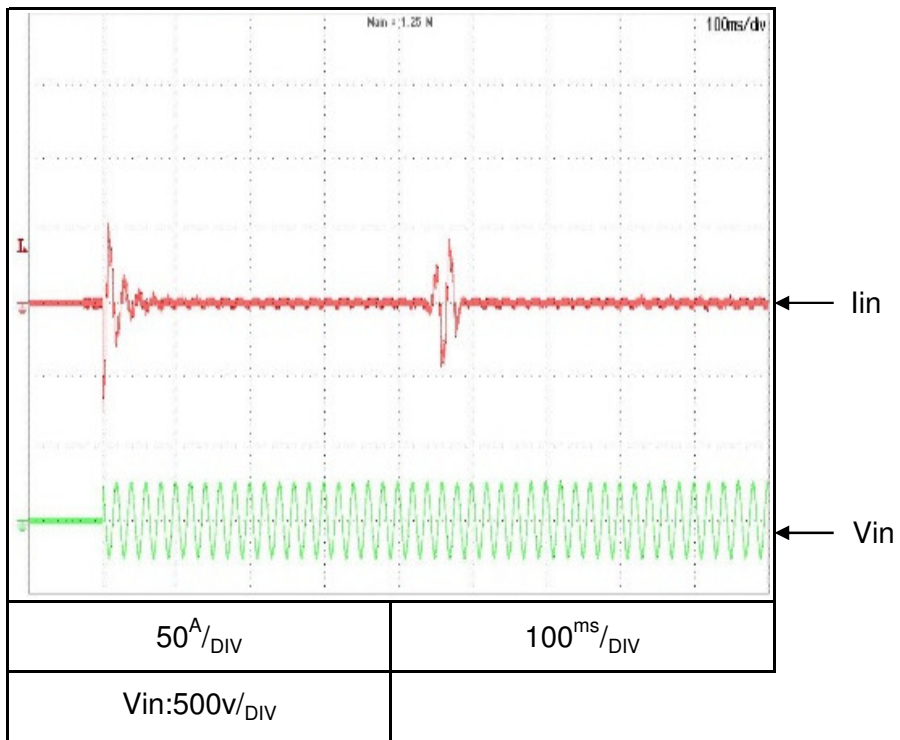
Switch on phase angle  
of input AC voltage

$\Phi=0^\circ$



Switch on phase angle  
of input AC voltage

$\Phi=90^\circ$



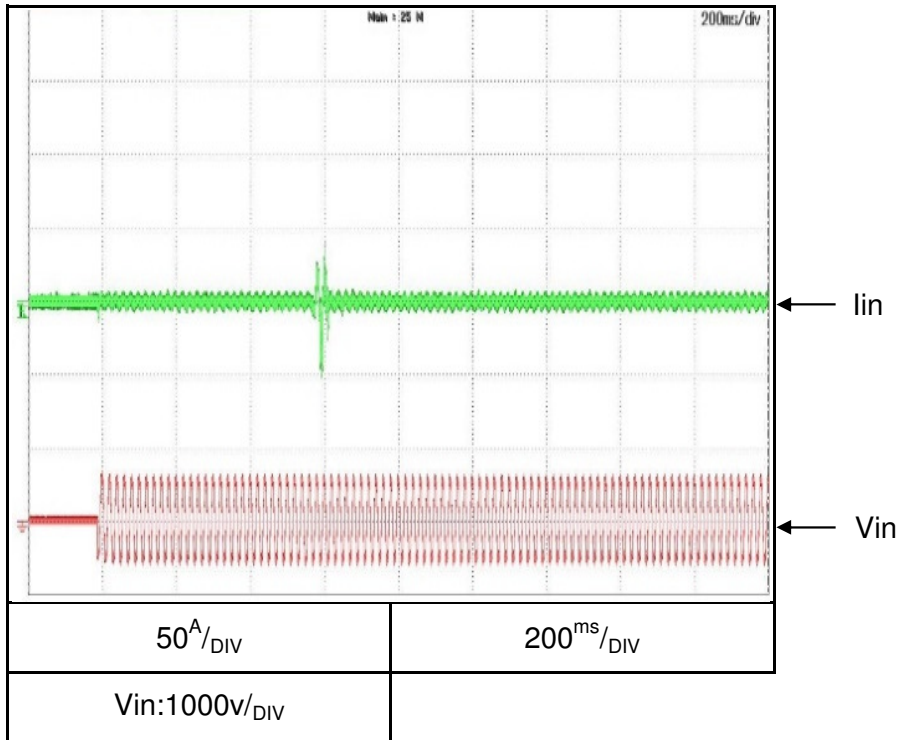
**2.10 Inrush current waveform**

Conditions: Vin: 480V  
Vout: 100%  
Iout: 100%  
Ta = 25°C

**3Φ400 Input**

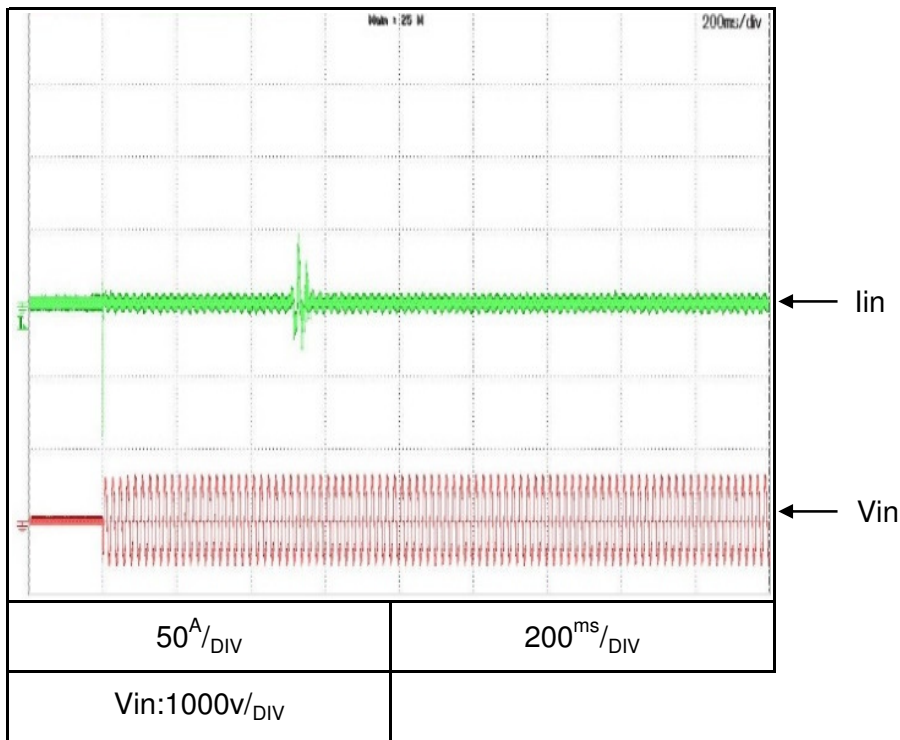
Switch on phase angle  
of input AC voltage

$\Phi=0^\circ$



Switch on phase angle  
of input AC voltage

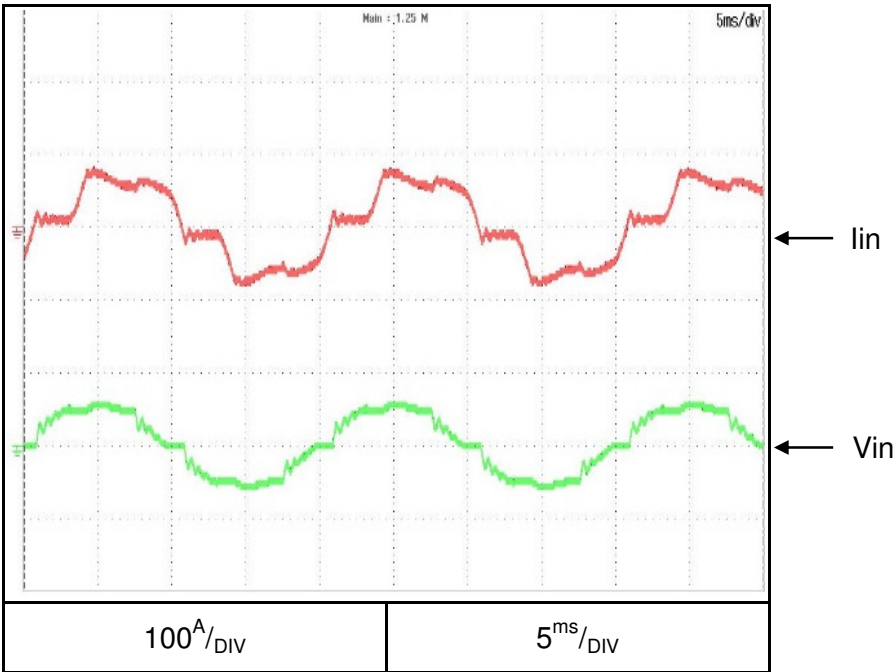
$\Phi=90^\circ$



**2.11 Input current waveform**

Conditions: Vin: 200VAC  
Vout: 100%  
Iout: 100%  
Ta = 25°C

**3Φ200 Input**

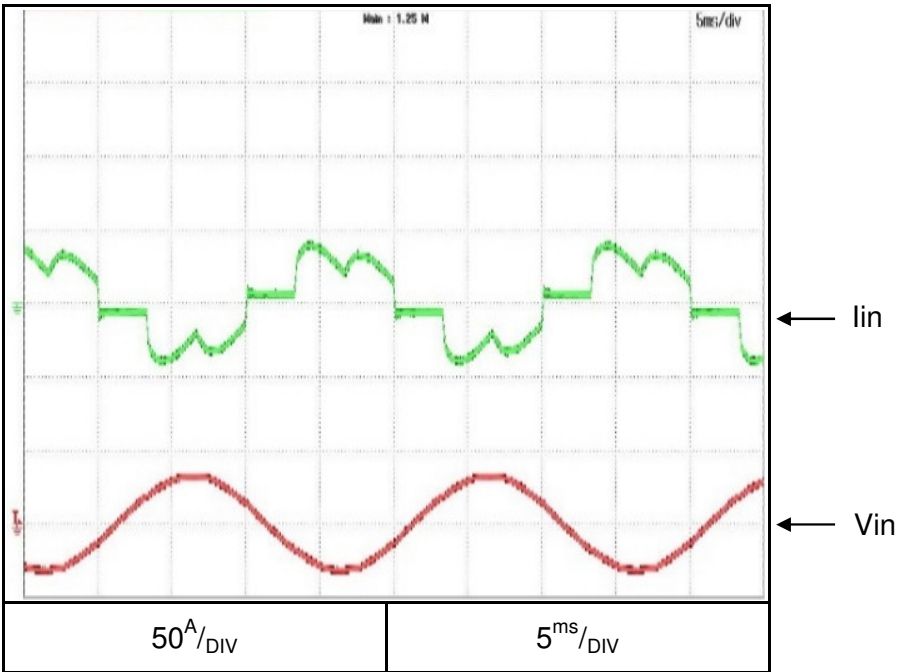




**2.11 Input current waveform**

Conditions: Vin: 400VAC  
Vout: 100%  
Iout: 100%  
Ta = 25°C

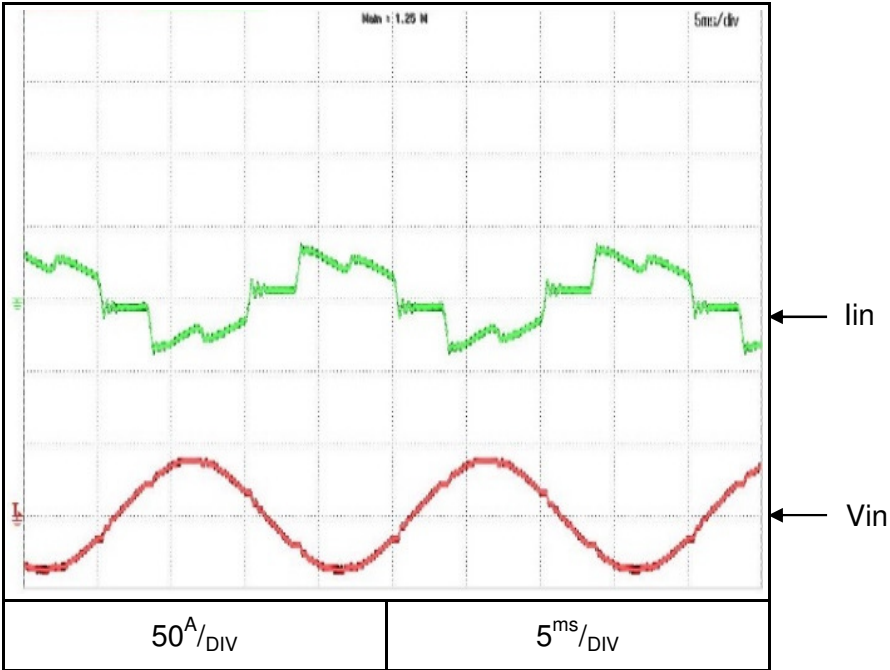
3Φ400 Input



**2.11 Input current waveform**

Conditions: Vin: 480VAC  
Vout: 100%  
Iout: 100%  
Ta = 25°C

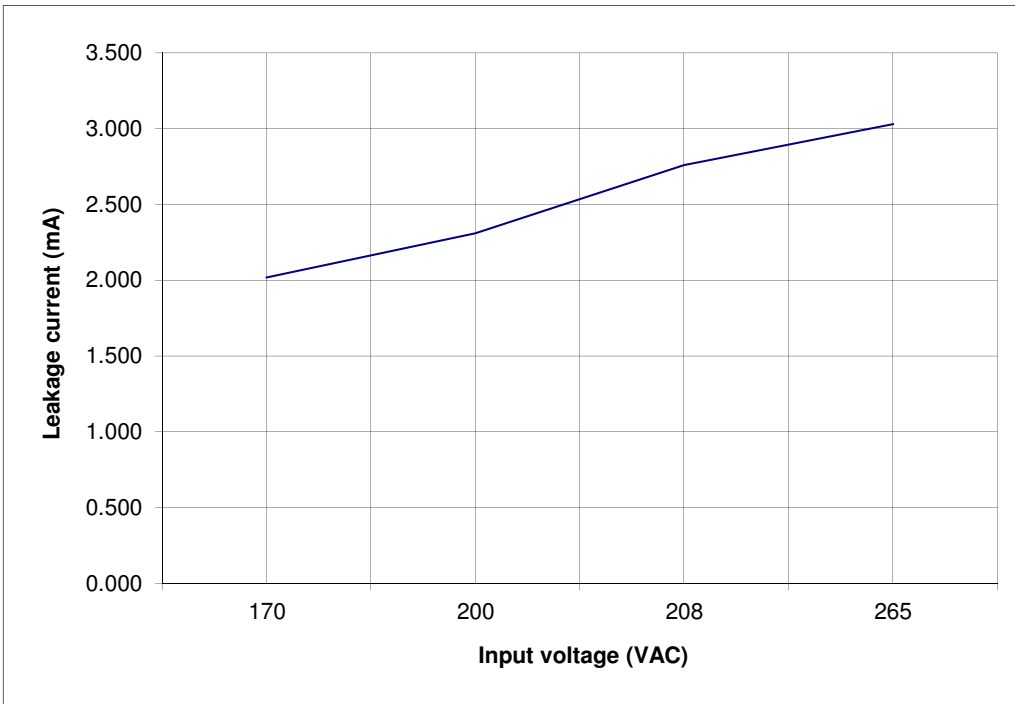
**3Φ480 Input**



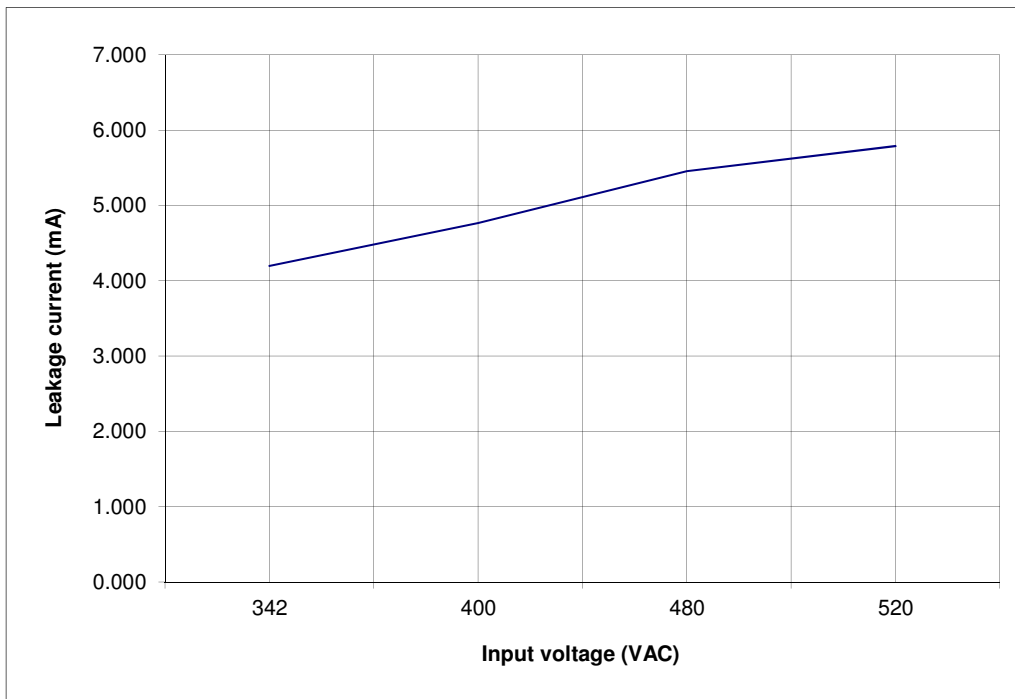
2.12 Leakage current characteristics

Conditions: Ta = 25 °C  
f=60Hz

3Φ 170-265V (\*)



3Φ 342-520V (\*)



(\*) TN & TT power system

**2.13 Output ripple & noise waveform**

C.V mode

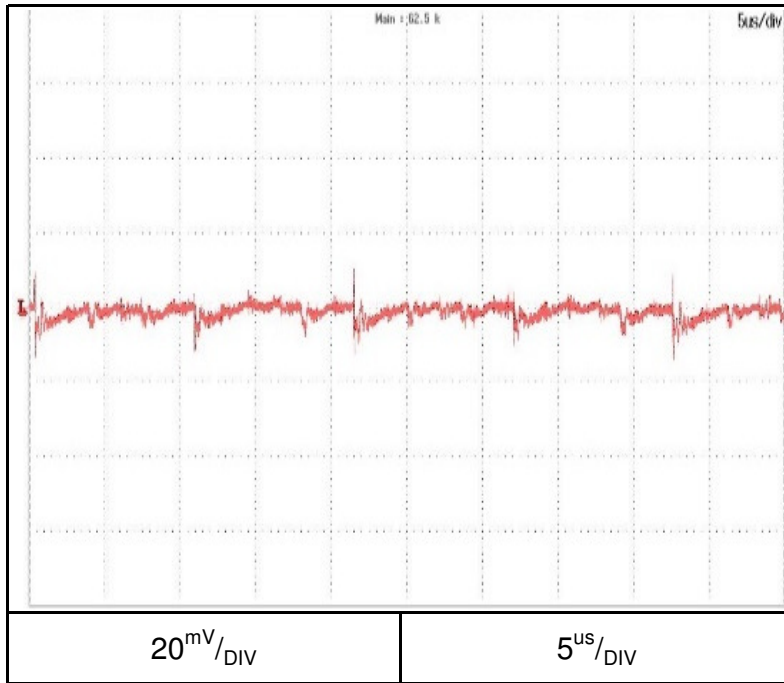
Conditions: Vout: 100%

Iout: 100%

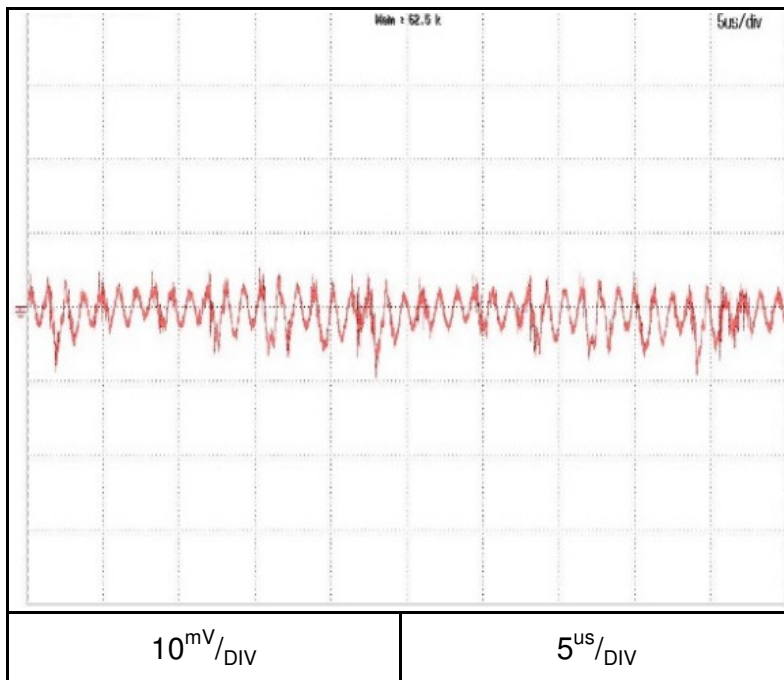
Ta = 25 °C

Normal Mode

GSP10-1500



GSP60-255



**2.14 Output ripple & noise waveform**

C.V mode

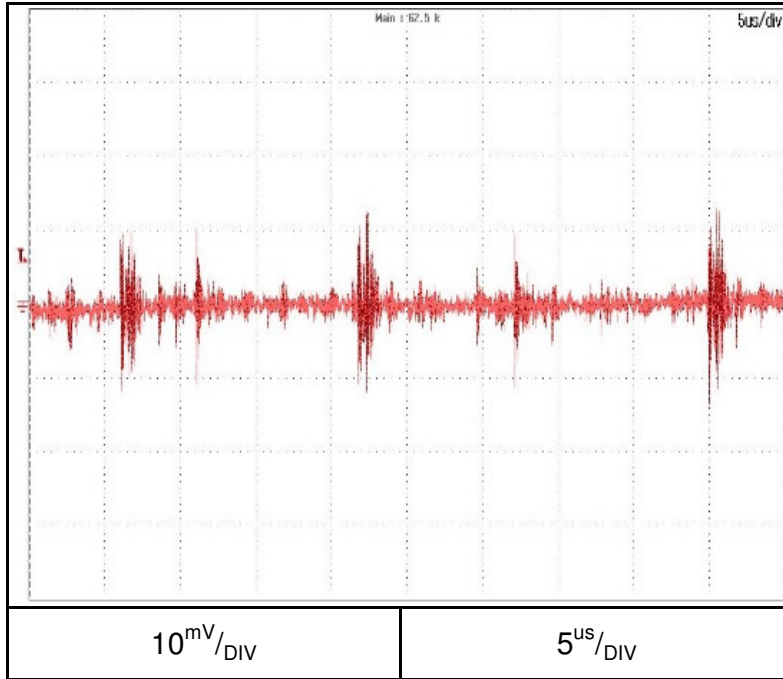
Conditions: Vout: 100%

Iout: 100%

Ta = 25 °C

Normal Mode

GSP150-102



GSP600-25.5

