

P R B X

POWERBOX Industrial Line
MAD26 Series
10W 4:1 Single and Dual Output
DC/DC Converter
Manual V1.0

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Features

6.6-10 W isolated output
Efficiency to 82%
4:1 input range
Pi input filter
Continuous short circuit protection
Meets EN55022 Class A, conducted



| Model Number | Input Voltage | Output Voltage | Output Current | Input Current | | Efficiency |
|--------------|---------------|----------------|----------------|---------------|-----------|------------|
| | | | | No Load | Full Load | |
| MAD 26 001 | 9-36 VDC | 3.3 VDC | 2000 mA | 15 mA | 362 mA | 76% |
| MAD 26 003 | 9-36 VDC | 5 VDC | 2000 mA | 15 mA | 534 mA | 78% |
| MAD 26 006 | 9-36 VDC | 12 VDC | 830 mA | 15 mA | 520 mA | 80% |
| MAD 26 009 | 9-36 VDC | 15 VDC | 666 mA | 15 mA | 520 mA | 80% |
| MAD 26 019 | 9-36 VDC | ±5 VDC | ±1000 mA | 20 mA | 520 mA | 80% |
| MAD 26 015 | 9-36 VDC | ±12 VDC | ±415 mA | 20 mA | 520 mA | 80% |
| MAD 26 018 | 9-36 VDC | ±15 VDC | ±333 mA | 20 mA | 520 mA | 80% |
| MAD 26 042 | 18-72 VDC | 3.3 VDC | 2000 mA | 10 mA | 181 mA | 76% |
| MAD 26 021 | 18-72 VDC | 5 VDC | 2000 mA | 10 mA | 260 mA | 80% |
| MAD 26 024 | 18-72 VDC | 12 VDC | 830 mA | 10 mA | 257 mA | 81% |
| MAD 26 027 | 18-72 VDC | 15 VDC | 666 mA | 10 mA | 257 mA | 81% |
| MAD 26 039 | 18-72 VDC | ±5 VDC | ±1000 mA | 15 mA | 253 mA | 82% |
| MAD 26 033 | 18-72 VDC | ±12 VDC | ±415 mA | 15 mA | 257 mA | 81% |
| MAD 26 036 | 18-72 VDC | ±15 VDC | ±333 mA | 15 mA | 253 mA | 82% |

Note:

- Nominal input voltage 24 or 48 VDC
- All specifications typical at nominal line , full load and 25oC unless otherwise notes.

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Input Specifications

| Parameters | Min | Nominal | Max | Unit | Note |
|---------------------|-----|---------|-----|------|-----------|
| Input voltage range | 9 | 24 | 36 | VDC | |
| | 18 | 48 | 72 | VDC | |
| Input filter | | | | | Pi-filter |

Output Specifications

| Parameters | Max | Unit | Note |
|------------------------------|------|-------|-----------------------------|
| Voltage accuracy | 1.0 | % | |
| Voltage balance (Dual) | 1.0 | % | |
| Temperature coefficient | 0.02 | %/°C | |
| Transient response | 500 | usec. | Single 25% step load change |
| | 500 | usec. | Dual FL-1/2L ±1% error band |
| Ripple and noise 20MHz BW | 75 | mVp-p | |
| Short circuit protection | | | Continuous |
| Line regulation, single/dual | 0.2 | % | From high line to low line |
| Load regulation, single/dual | 1.0 | % | From full load to 25% load |

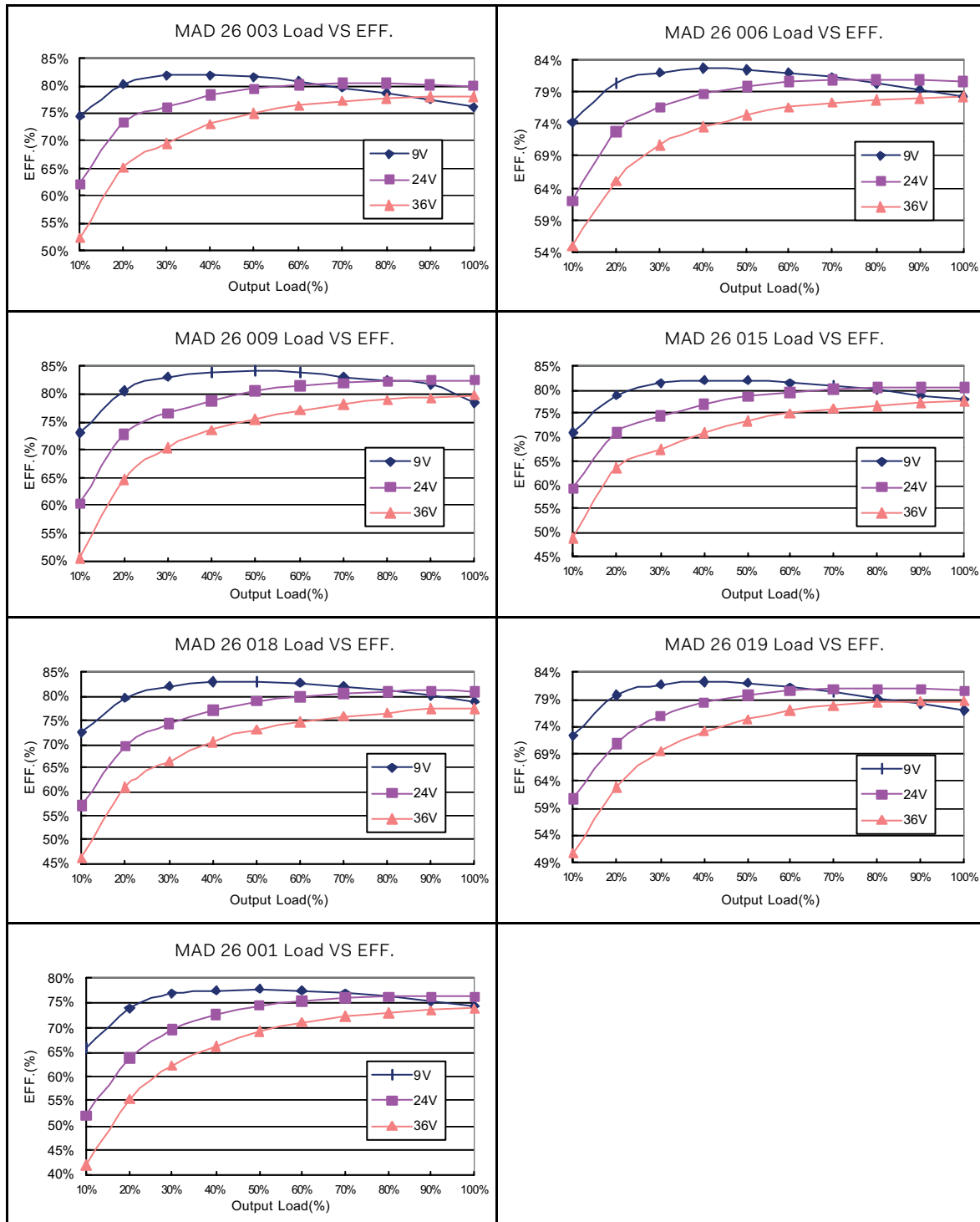
General Specifications

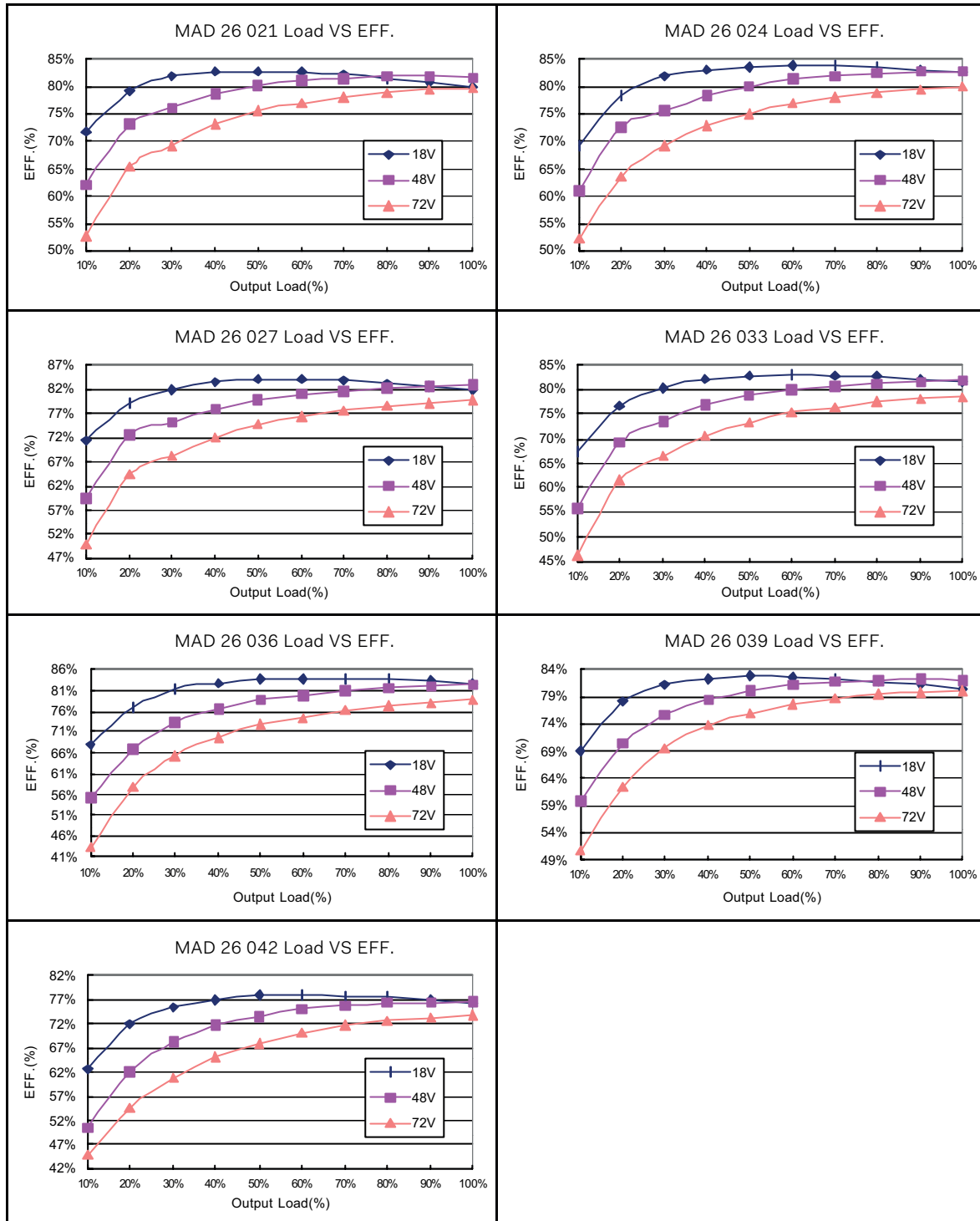
| Parameters | Min | Max | Unit | Note |
|-----------------------------------|-----------------|------|------|--|
| Isolation resistance | 10 ⁹ | | Ohms | |
| Switching frequency | | | KHz | 300KHz typical |
| Operating temperature range | -25 | +71 | °C | |
| Case temperature | | +100 | °C | |
| Cooling | | | | Free air convection |
| Storage temperature range | -40 | +100 | °C | |
| EMI/RFI | | | | Six sided continuous shield |
| Input to output isolation voltage | 500 | | VDC | |
| Case material | | | | Black coated copper with non-conductive base |
| Case dimensions | | | | 2 x 1 x 0.4 inches (50.8 x 25.4 x 10.2 mm) |

General Information

The MAD26 unit has many operational characterized aspects, including efficiency, start up delay time, overshoot, output ripple & noise and dynamic response to load.

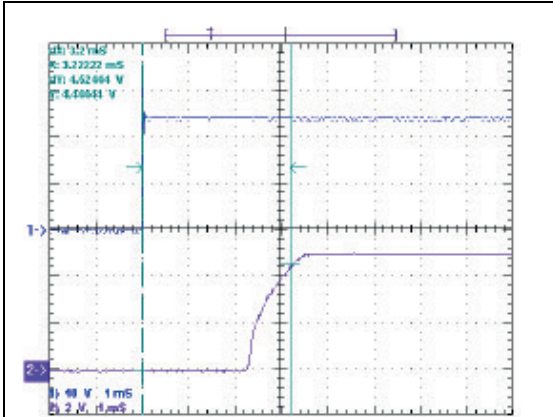
Efficiency



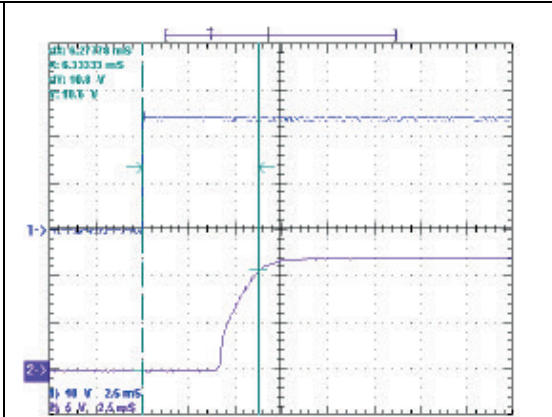


Start Up Delay Time

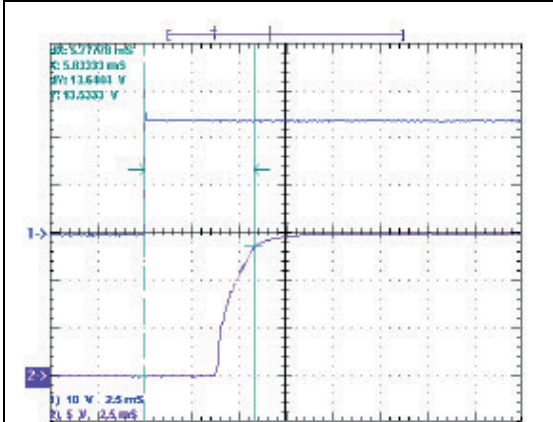
Start up input power, measuring the time between input power is turn on and output voltage go within 90% Vout. At nominal input and maximum load.



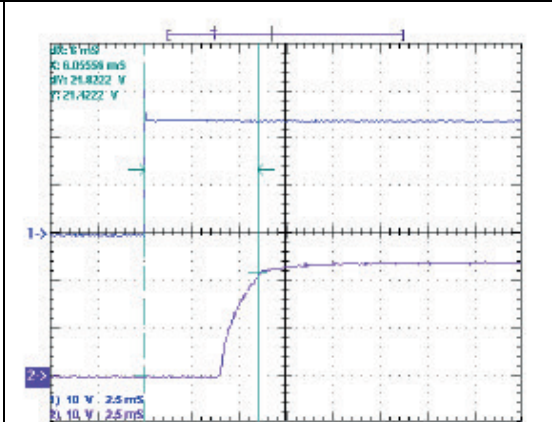
Model : MAD 26 003
Ch1 : Vin Ch2 : Vout
Delay time : 3.2ms



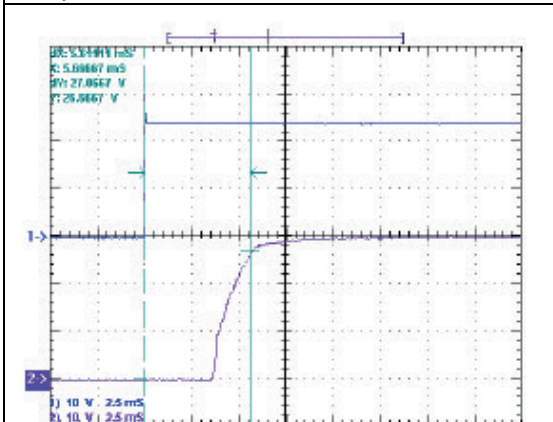
Model : MAD 26 006
Ch1 : Vin Ch2 : Vout
Delay time : 6.27ms



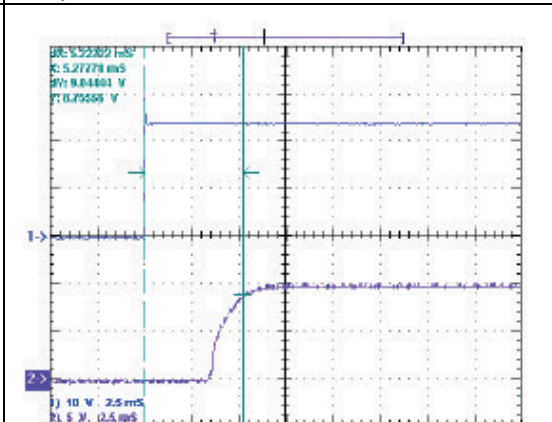
Model : MAD 26 009
Ch1 : Vin Ch2 : Vout
Delay time : 5.77ms



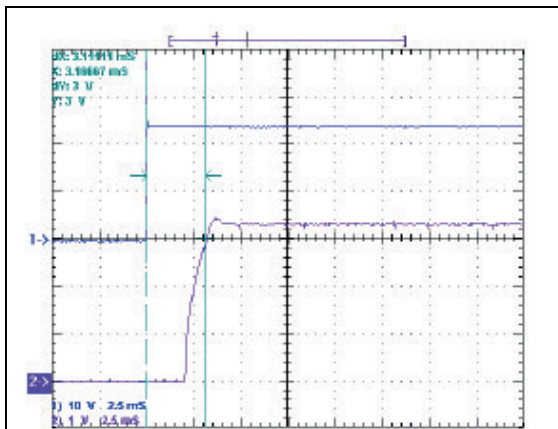
Model : MAD 26 015
Ch1 : Vin Ch2 : Vout
Delay time : 6ms



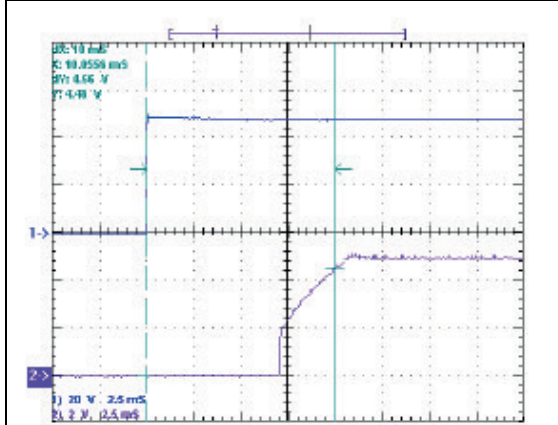
Model : MAD 26 018
Ch1 : Vin Ch2 : Vout
Delay time : 5.61ms



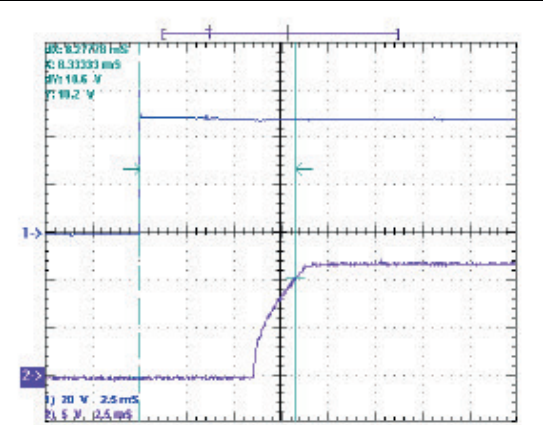
Model : EMAD 26 019
Ch1 : Vin Ch2 : Vout
Delay time : 5.22ms



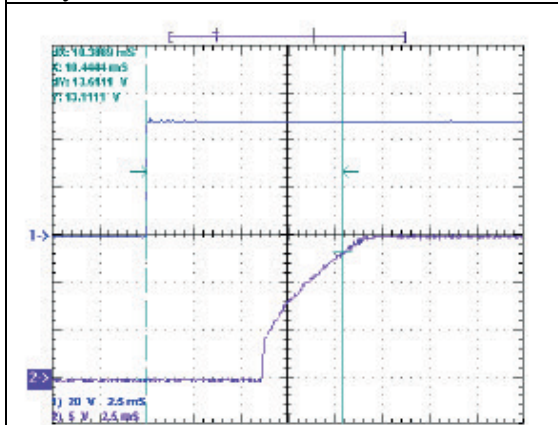
Model : MAD 26 001
Ch1 : Vin Ch2 : Vout
Delay time : 3.11ms



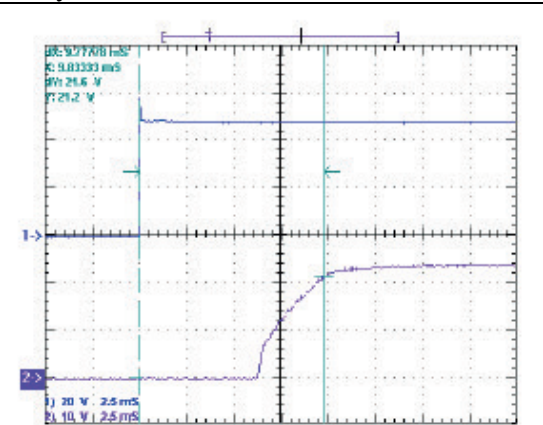
Model : MAD 26 021
Ch1 : Vin Ch2 : Vout
Delay time : 10ms



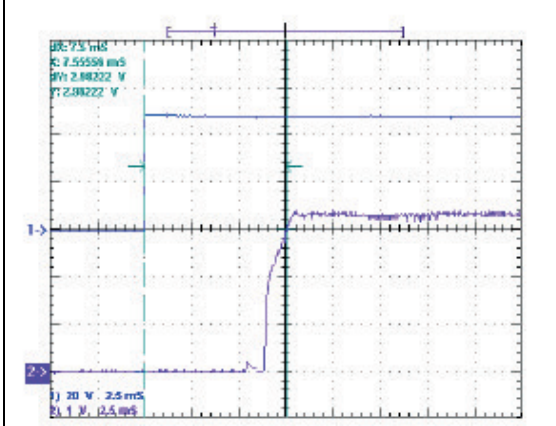
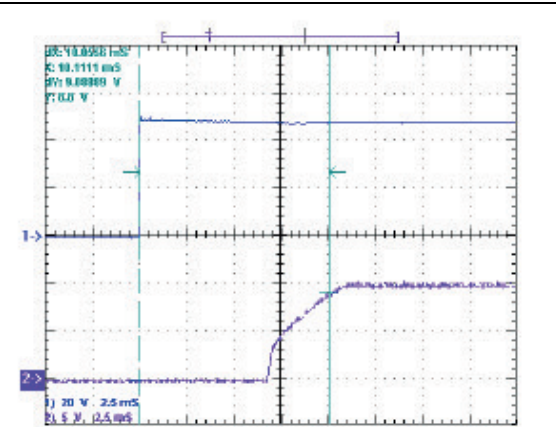
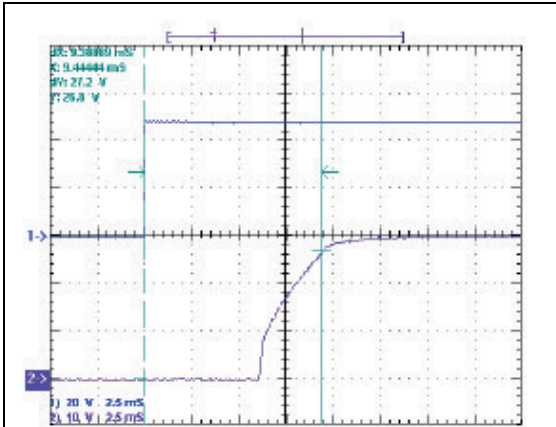
Model : MAD 26 024
Ch1 : Vin Ch2 : Vout
Delay time : 8.27ms



Model : MAD 26 027
Ch1 : Vin Ch2 : Vout
Delay time : 10.38ms



Model : MAD 26 033
Ch1 : Vin Ch2 : Vout
Delay time : 9.77ms

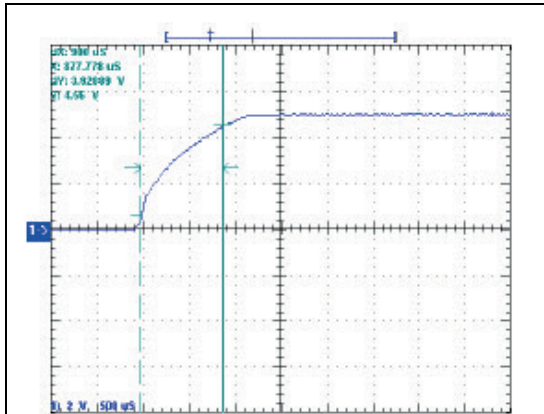


Overshoot

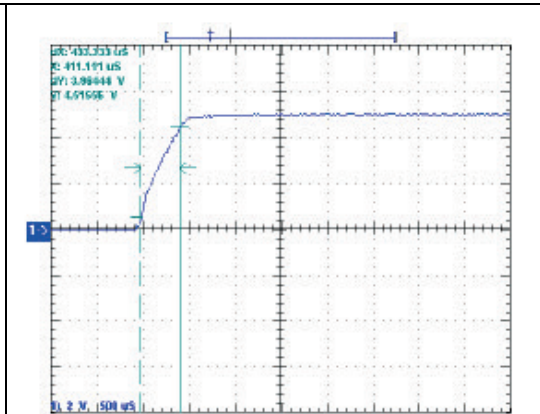
Start up input power, measuring the deviation which over the output. At nominal input , minimum load and maximum load.

Rise Time

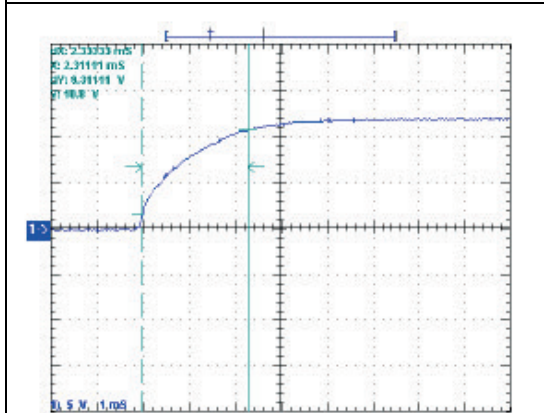
Measuring the time between 10%-Vout to 90%-Vout. At nominal input , minimum load and maximum load.



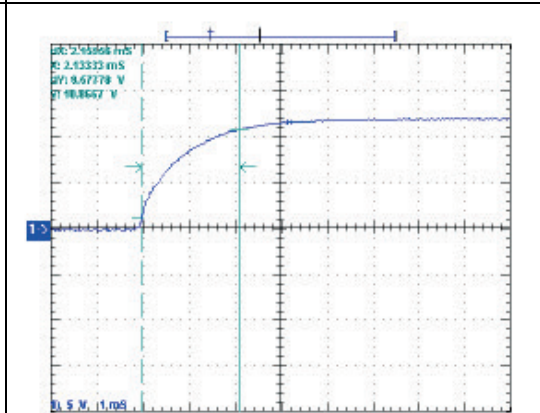
Model : MAD 26 003(maximum load)
Ch1 : Vout
Rise time : 900us
Overshoot : zero%



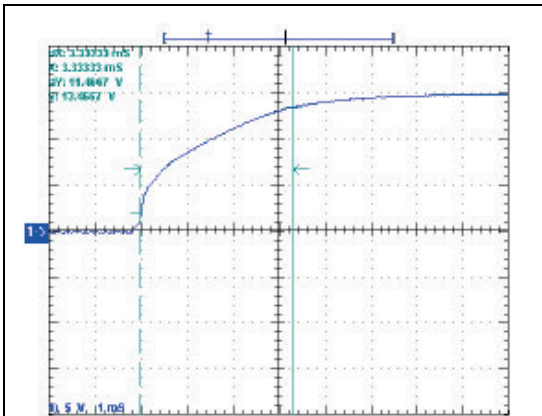
Model : MAD 26 003(minimum load)
Ch1 : Vout
Rise time : 433us
Overshoot : zero%



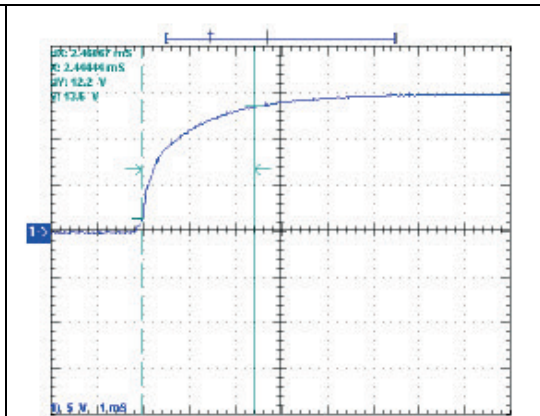
Model : MAD 26 006(maximum load)
Ch1 : Vout
Rise time : 2.33ms
Overshoot : zero%



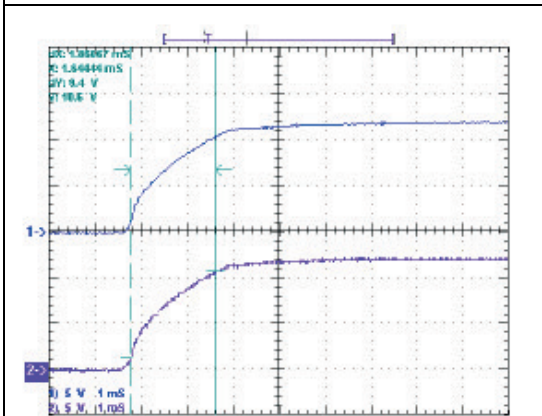
Model : MAD 26 006(minimum load)
Ch1 : Vout
Rise time : 2.15ms
Overshoot : zero%



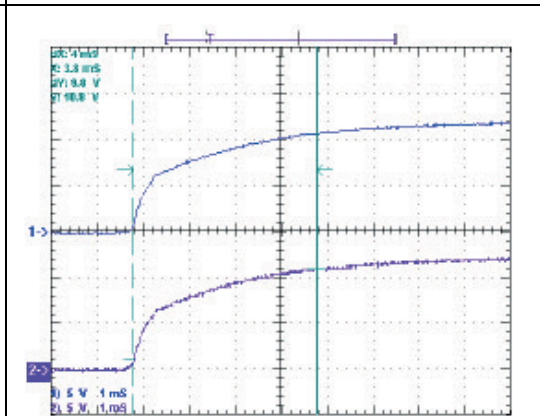
Model : MAD 26 009(maximum load)
Ch1 : Vout
Rise time : 3.33ms
Overshoot : zero%



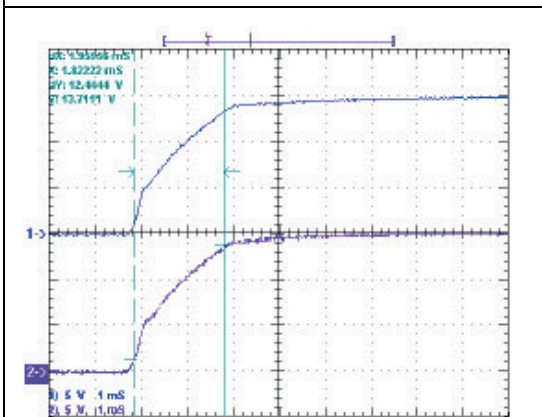
Model : MAD 26 009(minimum load)
Ch1 : Vout
Rise time : 2.46ms
Overshoot : zero%



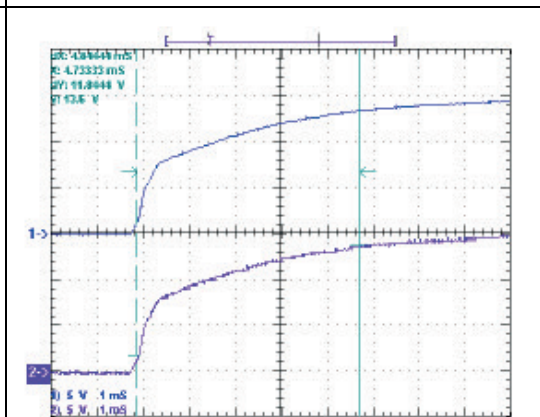
Model : MAD 26 015(maximum load)
Ch1 : +Vout Ch2 : -Vout
Rise time : 1.88ms / 1.88ms
Overshoot : zero%



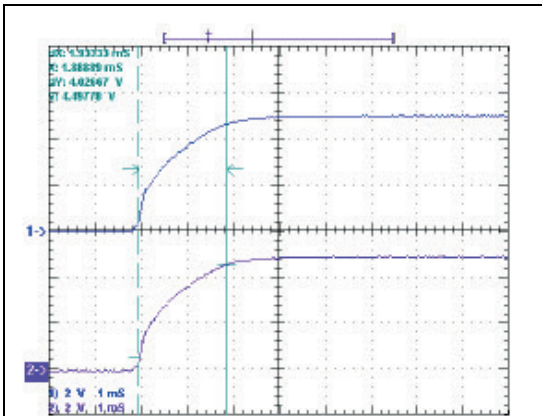
Model : MAD 26 015(minimum load)
Ch1 : +Vout Ch2 : -Vout
Rise time : 4ms / 4ms
Overshoot : zero%



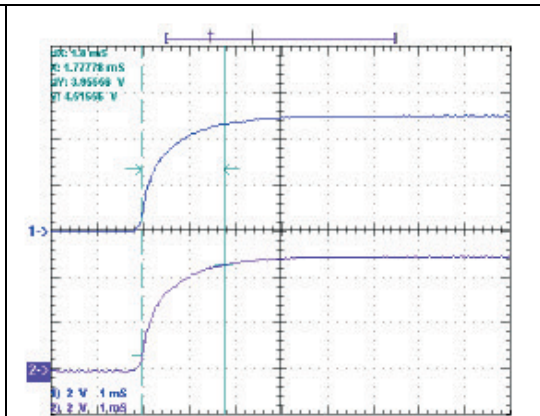
Model : MAD 26 018(maximum load)
Ch1 : +Vout Ch2 : -Vout
Rise time : 1.95ms / 1.95ms
Overshoot : zero%



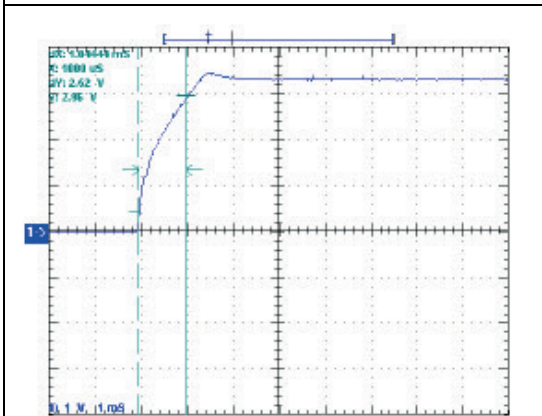
Model : MAD 26 018(minimum load)
Ch1 : +Vout Ch2 : -Vout
Rise time : 4.84ms / 4.84ms
Overshoot : zero%



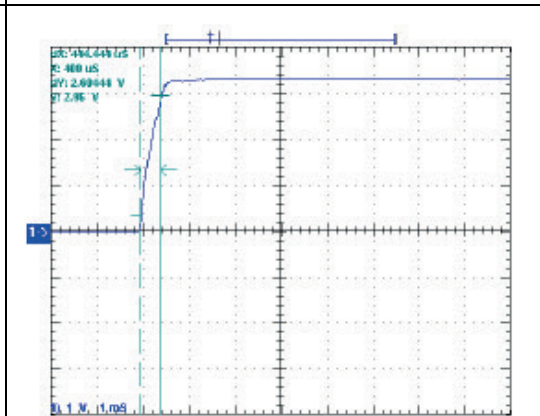
Model : MAD 26 019(maximum load)
Ch1 : +Vout Ch2 : -Vout
Rise time : 1.93ms / 1.93ms
Overshoot : zero%



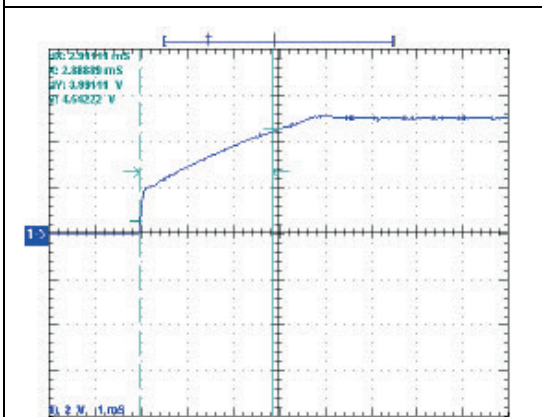
Model : MAD 26 019(minimum load)
Ch1 : +Vout Ch2 : -Vout
Rise time : 1.8ms / 1.8ms
Overshoot : zero%



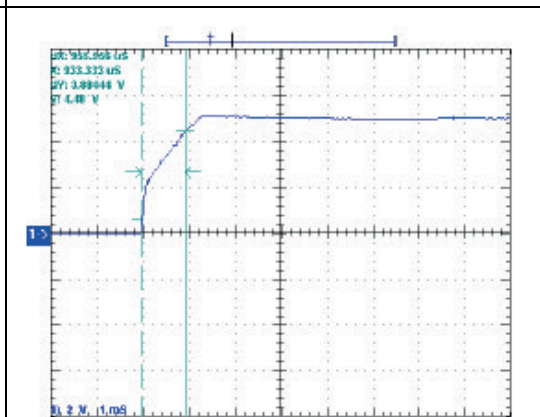
Model : MAD 26 001(maximum load)
Ch1 : Vout
Rise time : 1.04ms
Overshoot : 5.4%



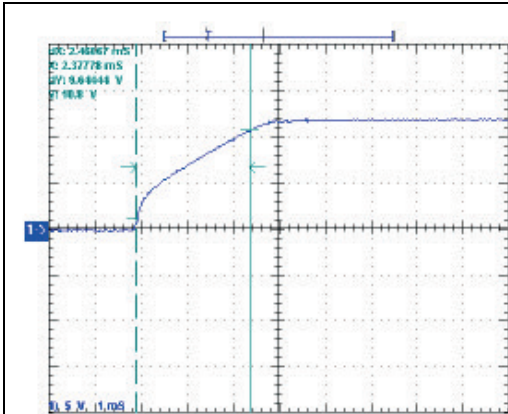
Model : MAD 26 001(minimum load)
Ch1 : Vout
Rise time : 444us
Overshoot : zero%



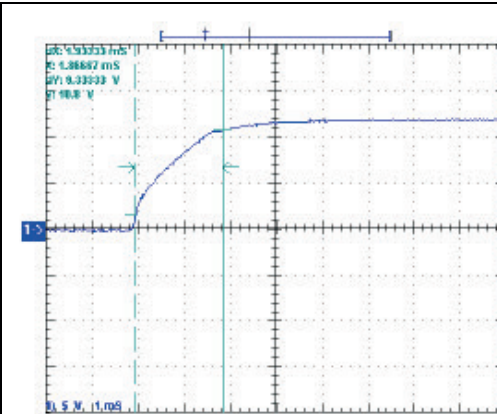
Model : MAD 26 021(maximum load)
Ch1 : Vout
Rise time : 2.91ms
Overshoot : 3%



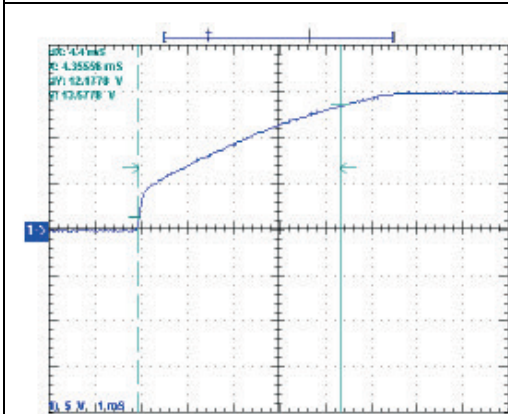
Model : MAD 26 021(minimum load)
Ch1 : Vout
Rise time : 955us
Overshoot : 3%



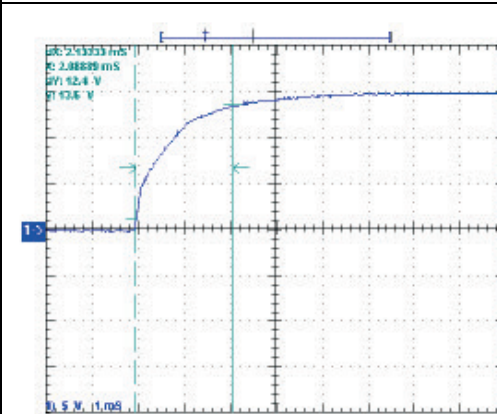
Model : MAD 26 024(maximum load)
Ch1 : Vout
Rise time : 2.46ms
Overshoot : zero%



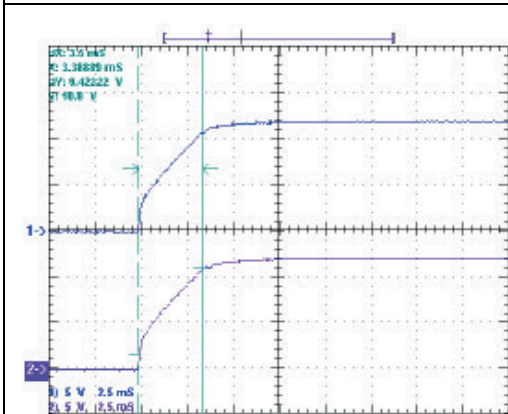
Model : MAD 26 024(minimum load)
Ch1 : Vout
Rise time : 1.93ms
Overshoot : zero%



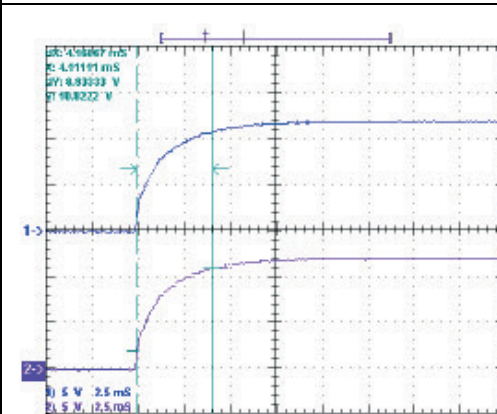
Model : MAD 26 027(maximum load)
Ch1 : Vout
Rise time : 4.4ms
Overshoot : zero%



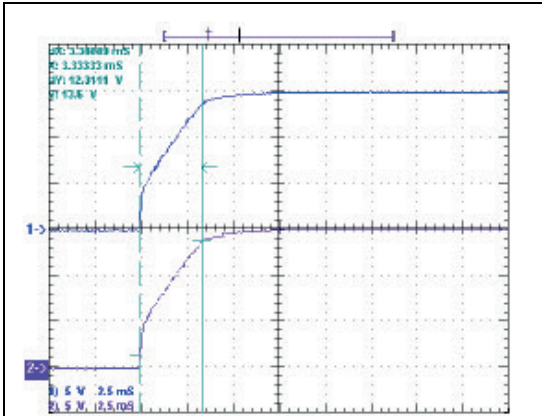
Model : MAD 26 027(minimum load)
Ch1 : Vout
Rise time : 2.13ms
Overshoot : zero%



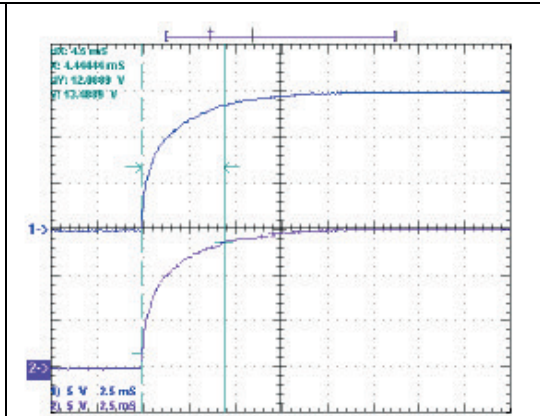
Model : MAD 26 033(maximum load)
Ch1 : +Vout Ch2 : -Vout
Rise time : 3.5ms / 3.5ms
Overshoot : zero%



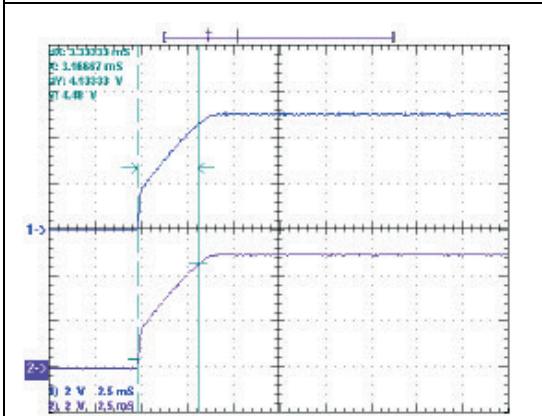
Model : MAD 26 033(minimum load)
Ch1 : +Vout Ch2 : -Vout
Rise time : 4.16ms / 4.16ms
Overshoot : zero%



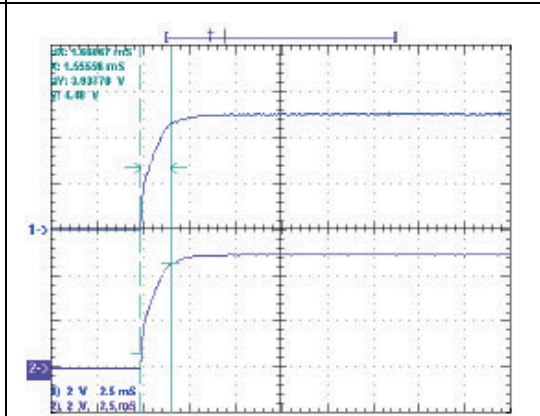
Model : MAD 26 036(maximum load)
Ch1 : +Vout Ch2 : -Vout
Rise time : 3.38ms / 3.38ms
Overshoot : zero%



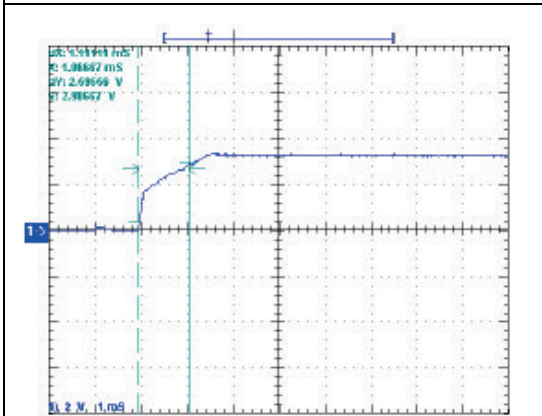
Model : MAD 26 036(minimum load)
Ch1 : +Vout Ch2 : -Vout
Rise time : 4.5ms / 4.5ms
Overshoot : zero%



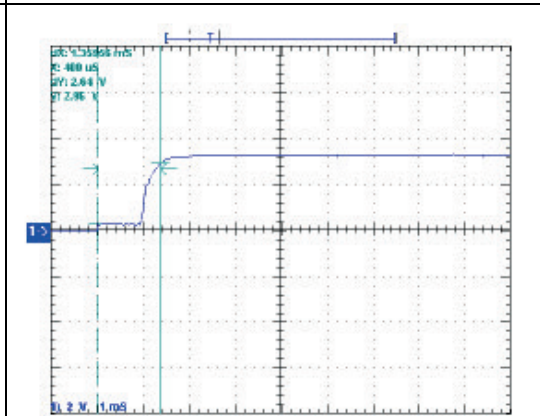
Model : MAD 26 039(maximum load)
Ch1 : +Vout Ch2 : -Vout
Rise time : 3.33ms / 3.33ms
Overshoot : zero%



Model : MAD 26 039(minimum load)
Ch1 : +Vout Ch2 : -Vout
Rise time : 1.66ms / 1.66ms
Overshoot : zero%



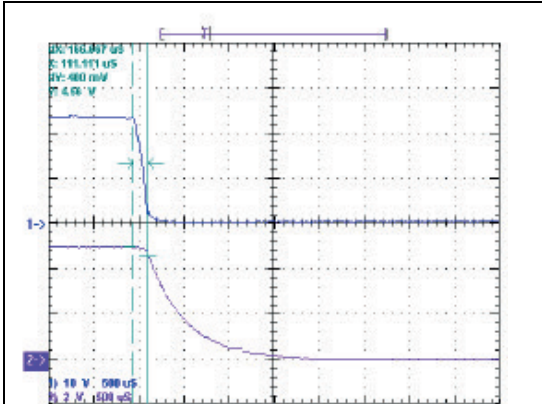
Model : MAD 26 042(maximum load)
Ch1 : Vout
Rise time : 1.11ms
Overshoot : 4%



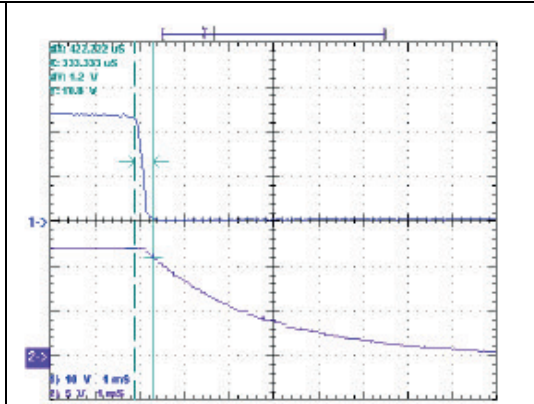
Model : MAD 26 042(minimum load)
Ch1 : Vout
Rise time : 1.35ms
Overshoot : zero%

Hold Time

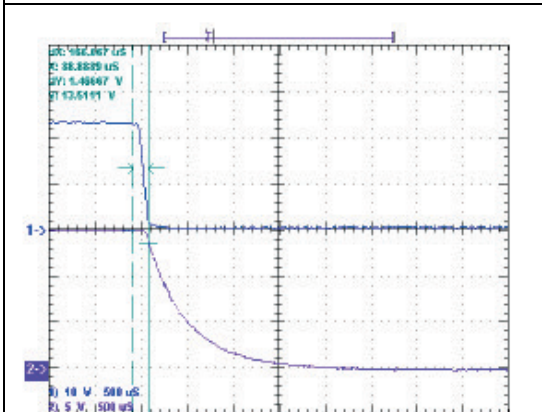
Measure from the power supply end to when Vout drop down to 90% output. At nominal input and maximum load.



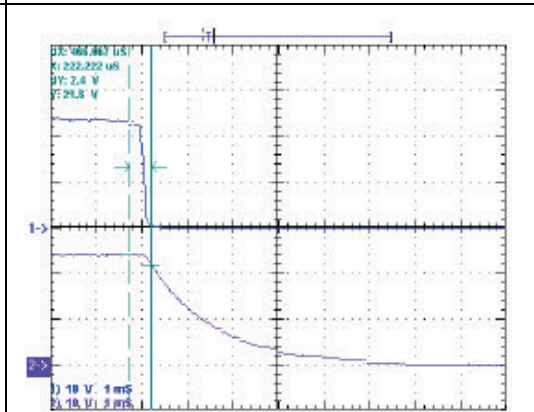
Model : MAD 26 003
Ch1 : Vin Ch2 : Vout
Hold time : 166us



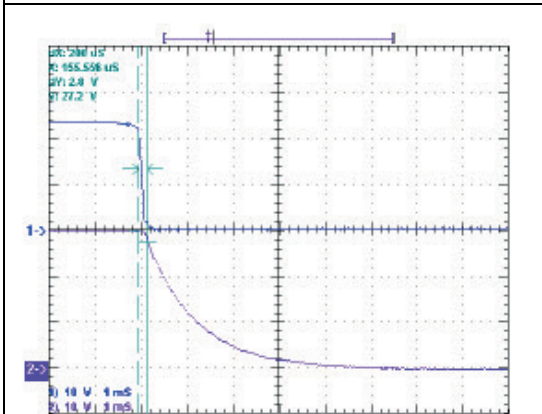
Model : MAD 26 006
Ch1 : Vin Ch2 : Vout
Hold time : 422us



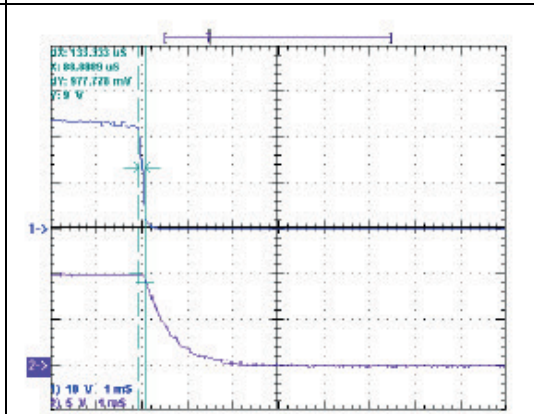
Model : MAD 26 009
Ch1 : Vin Ch2 : Vout
Hold time : 166us



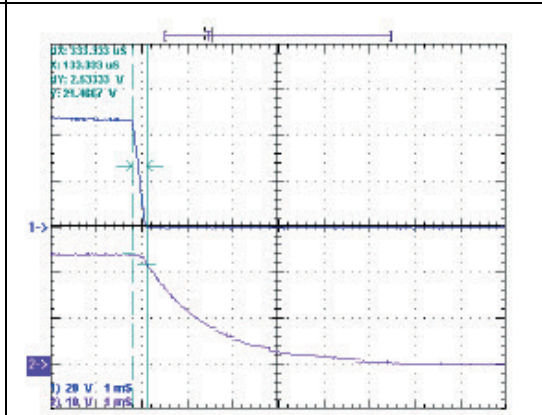
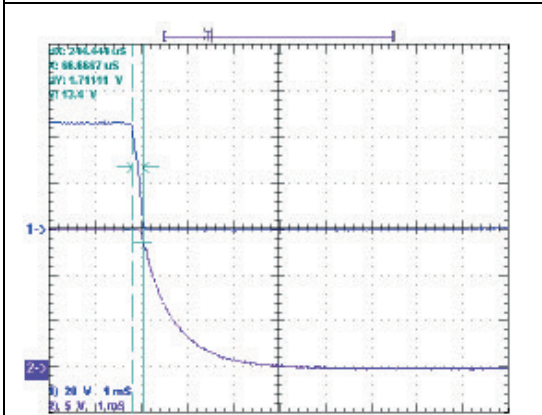
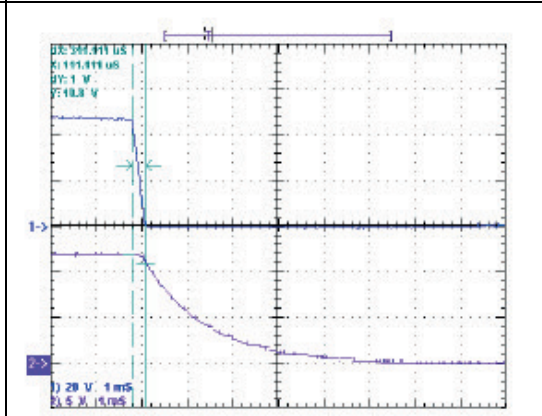
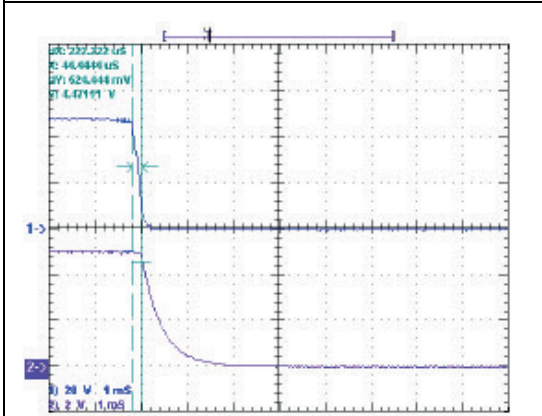
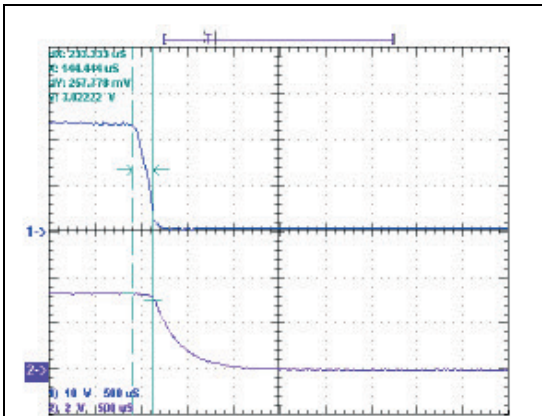
Model : MAD 26 015
Ch1 : Vin Ch2 : Vout
Hold time : 466us

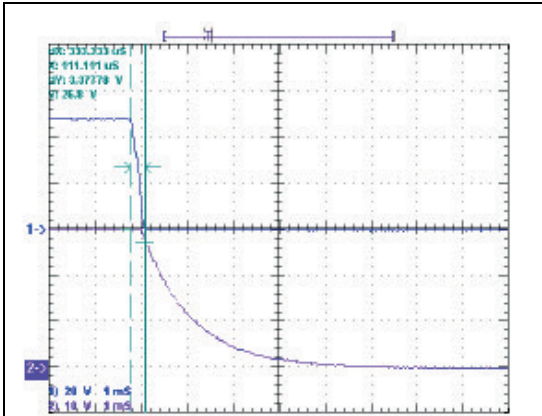


Model : MAD 26 018
Ch1 : Vin Ch2 : Vout
Hold time : 200us

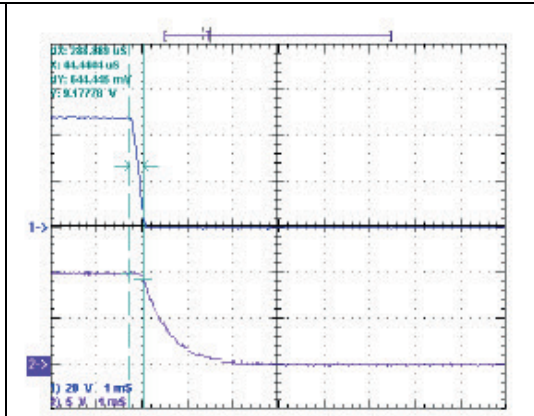


Model : MAD 26 019
Ch1 : Vin Ch2 : Vout
Hold time : 133us

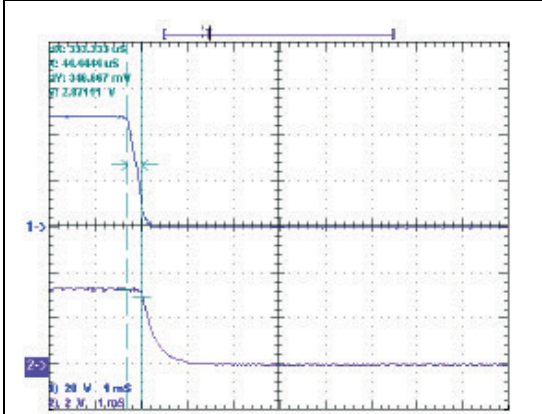




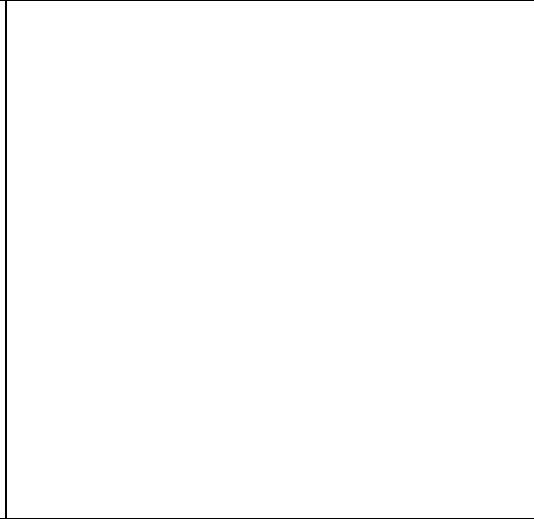
Model : MAD 26 036
Ch1 : Vin Ch2 : Vout
Hold time : 333us



Model : MAD 26 039
Ch1 : Vin Ch2 : Vout
Hold time : 288us

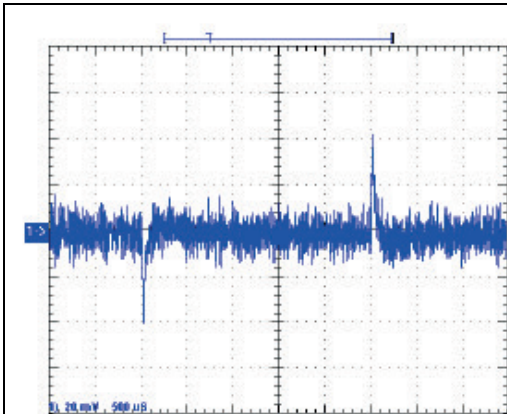


Model : MAD 26 042
Ch1 : Vin Ch2 : Vout
Hold time : 333us

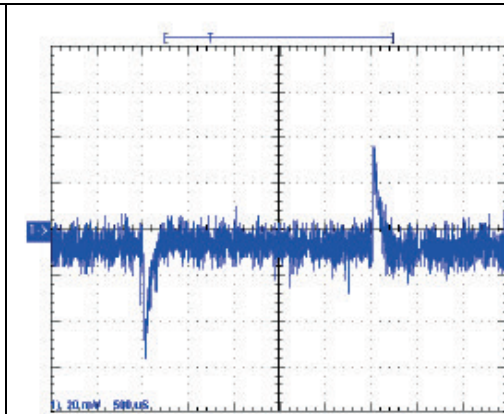


Dynamic Response

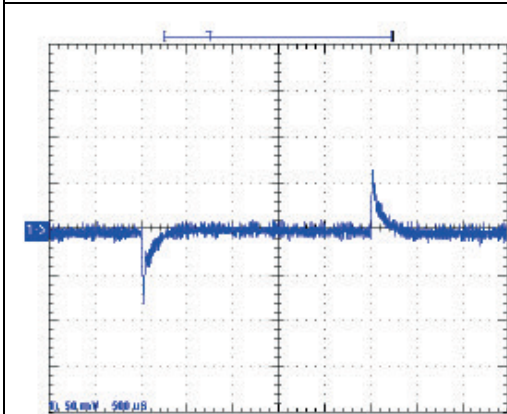
Output voltage dynamic response at nominal input and different load condition (load change 100% load to 75% load). Load current=0.1A/us, Ton=Toff=2.5ms.



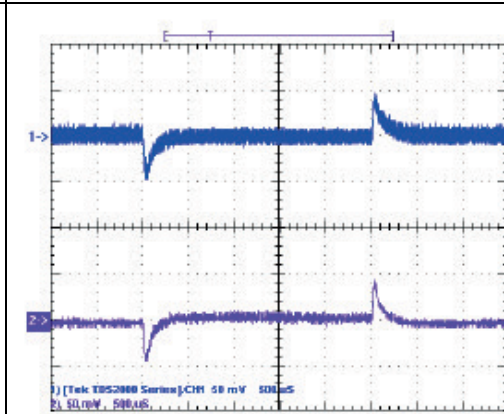
Model : MAD 26 003
Ch1 : Vout



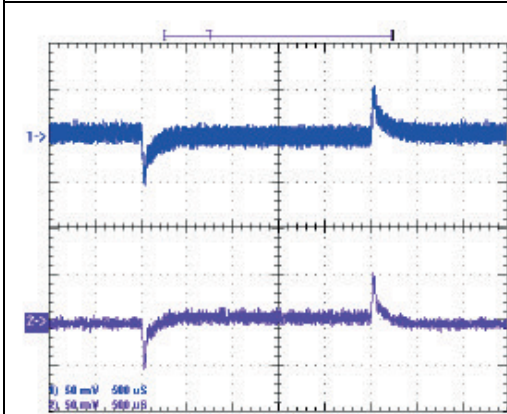
Model : MAD 26 006
Ch1 : Vout



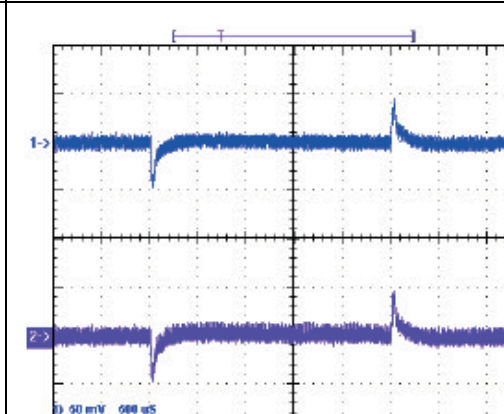
Model : MAD 26 009
Ch1 : Vout



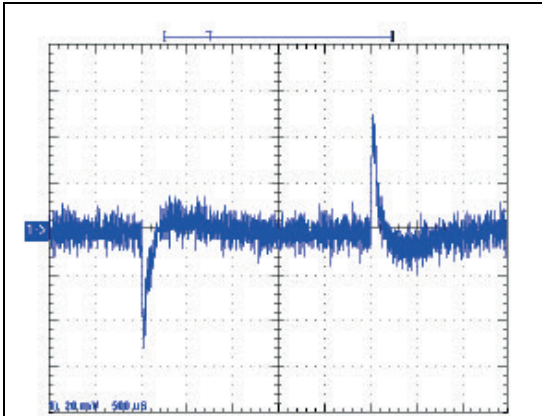
Model : MAD 26 015
Ch1 : Vout



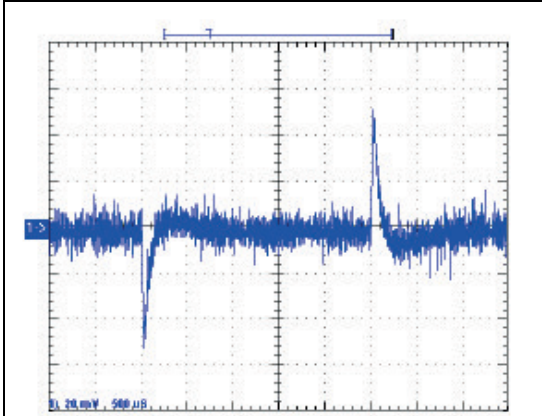
Model : MAD 26 018
Ch1 : Vout



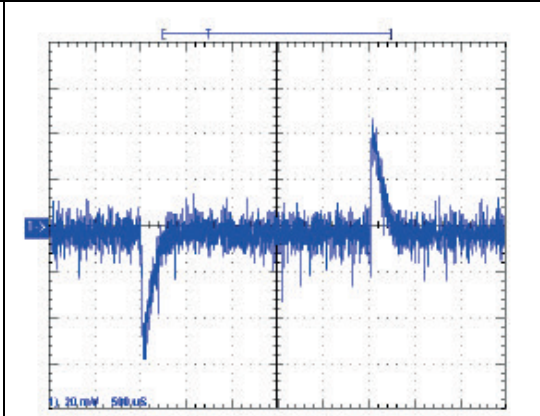
Model : MAD 26 019
Ch1 : Vout



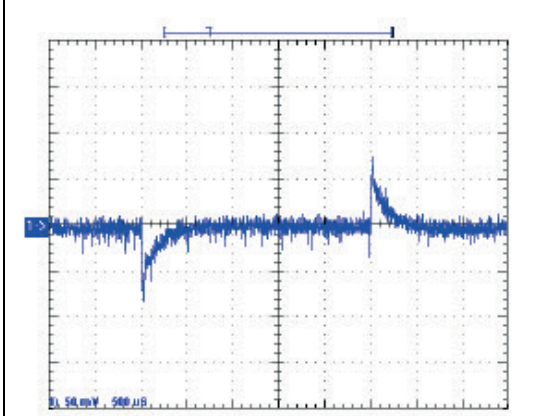
Model : MAD 26 001
Ch1 : Vout



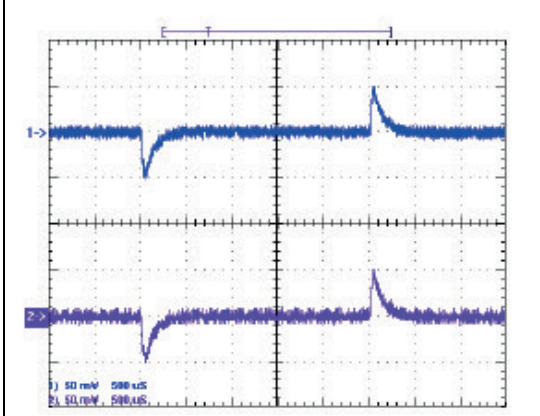
Model : MAD 26 021
Ch1 : Vout



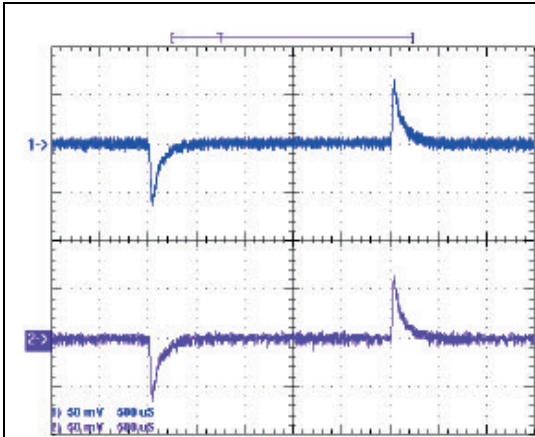
Model : MAD 26 024
Ch1 : Vout



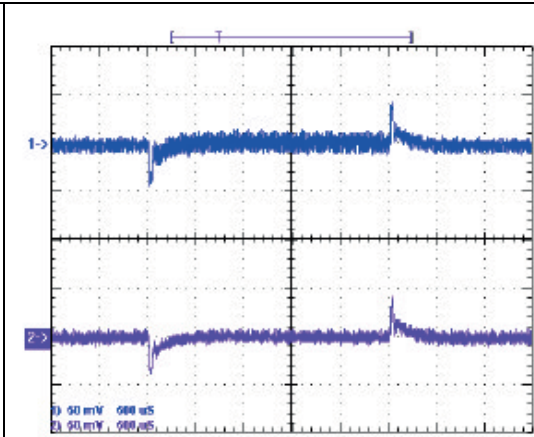
Model : MAD 26 027
Ch1 : Vout



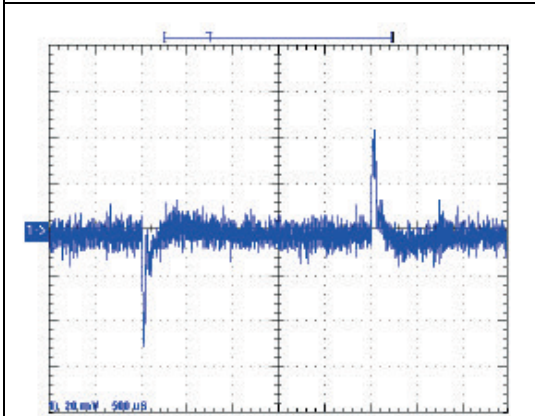
Model : MAD 26 033
Ch1 : Vout



Model : MAD 26 036
Ch1 : Vout



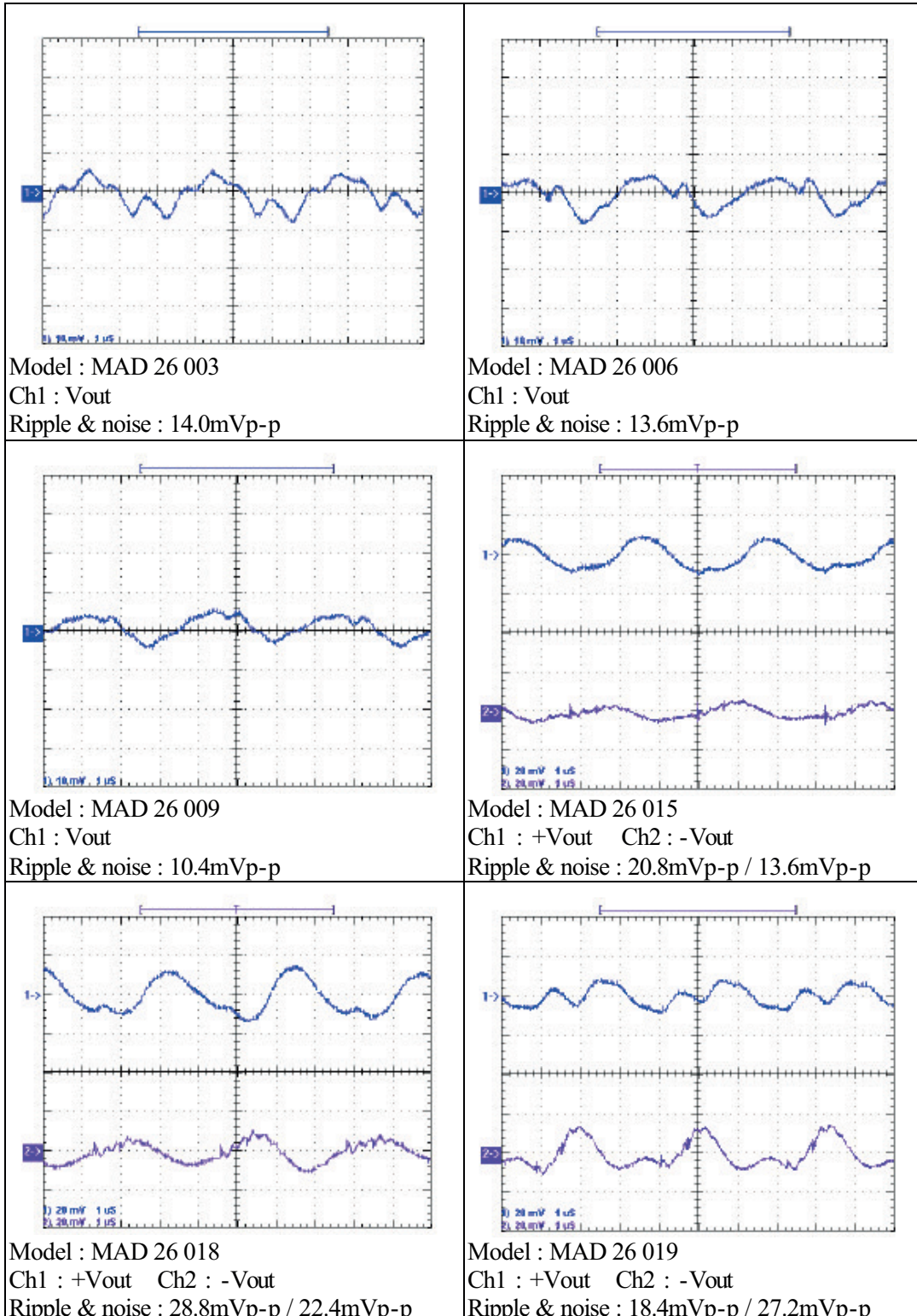
Model : MAD 26 039
Ch1 : Vout

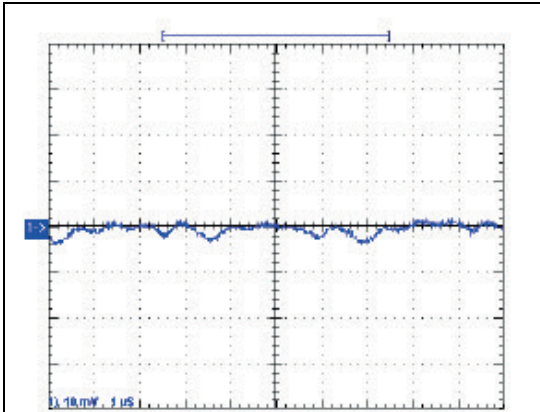


Model : MAD 26 042
Ch1 : Vout

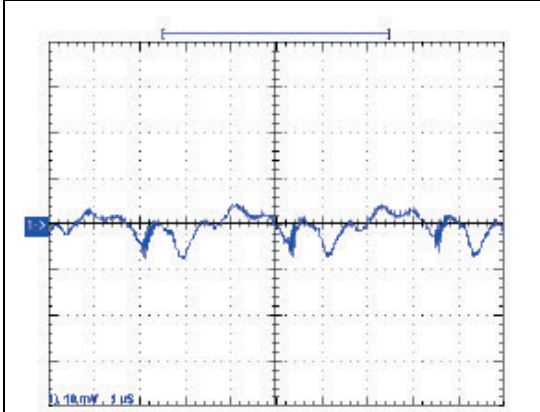
Output Ripple and Noise

Measuring output ripple waveform peak to peak. Measure mane bandwidth 20 MHz. At nominal input, maximum lout and output with a 0.1uF ceramic capacitor.

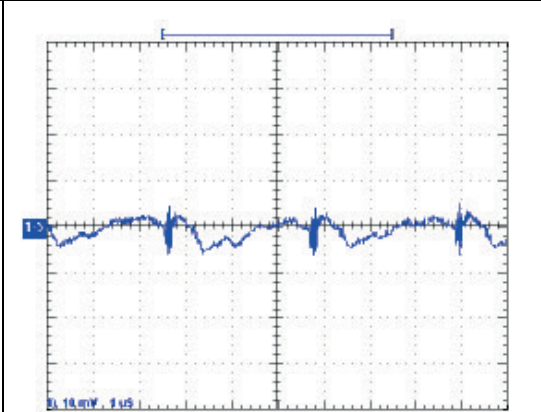




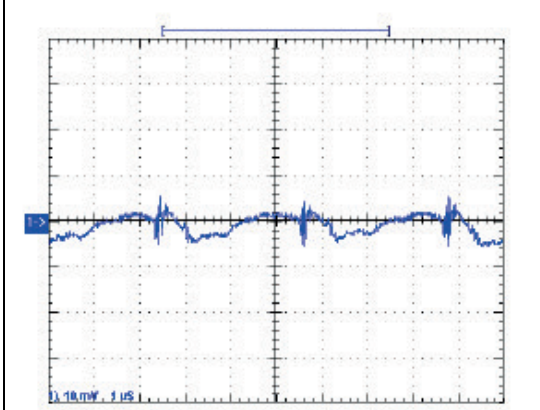
Model : MAD 26 001
Ch1 : Vout
Ripple & noise : 6.0mVp-p



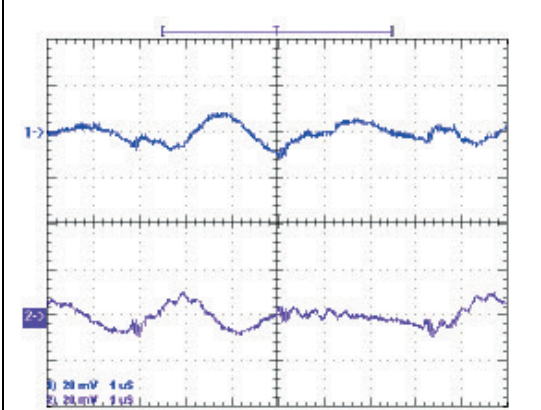
Model : MAD 26 021
Ch1 : Vout
Ripple & noise : 13.2mVp-p



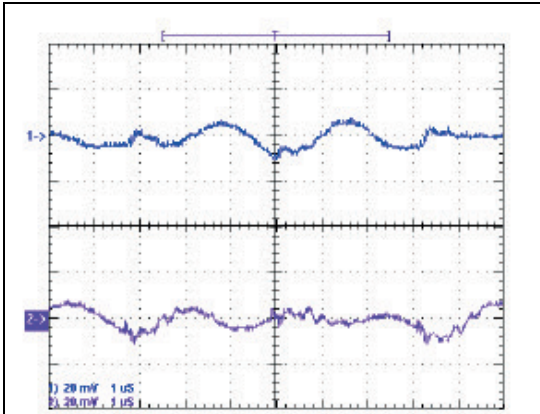
Model : MAD 26 024
Ch1 : Vout
Ripple & noise : 10.8mVp-p



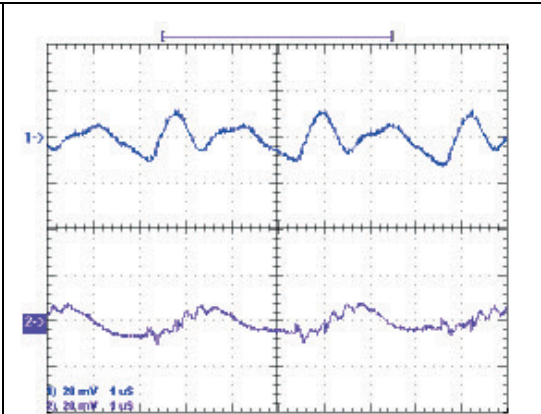
Model : MAD 26 027
Ch1 : Vout
Ripple & noise : 11.6mVp-p



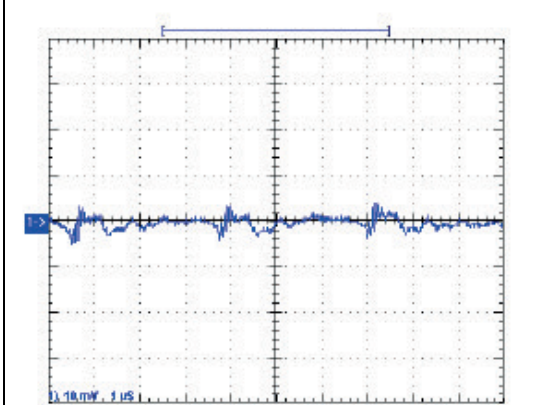
Model : MAD 26 033
Ch1 : +Vout Ch2 : -Vout
Ripple & noise : 21.6mVp-p / 20.8mVp-p



Model : MAD 26 036
Ch1 : +Vout Ch2 : -Vout
Ripple & noise : 19.2mVp-p / 20.0mVp-p



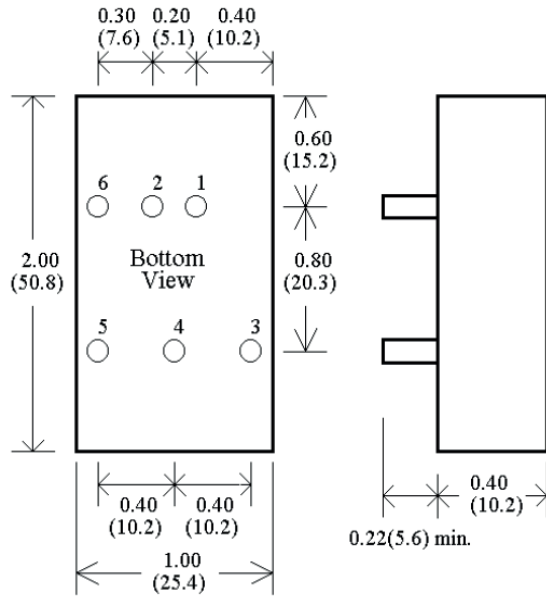
Model : MAD 26 039
Ch1 : +Vout Ch2 : -Vout
Ripple & noise : 26.4mVp-p / 19.2mVp-p



Model : MAD 26 042
Ch1 : Vout
Ripple & noise : 8.8mVp-p

Mechanical Outline Diagrams

B case mechanical outline diagrams



- Note : 1. Pin size is 0.04"inch(1.0mm)DIA.
2. All dimensions in inches(mm)
3. Tolerance .XX=±.04 , .XXX=±.010

Pin connection

| Pin | Function |
|-----|------------|
| 1 | +V input |
| 2 | - V input |
| 3 | +V output |
| 4 | NP/Common |
| 5 | - V output |
| 6 | NP |

Note : 1. NP - No Pin