

P R B X

POWERBOX Industrial Line
MAB03 Series
3W 2:1 Single and Dual Output
DC/DC Converter
Manual V1.2

Features

2-3 W isolated output

24-pin Dip package

Efficiency to 80%

2:1 input range

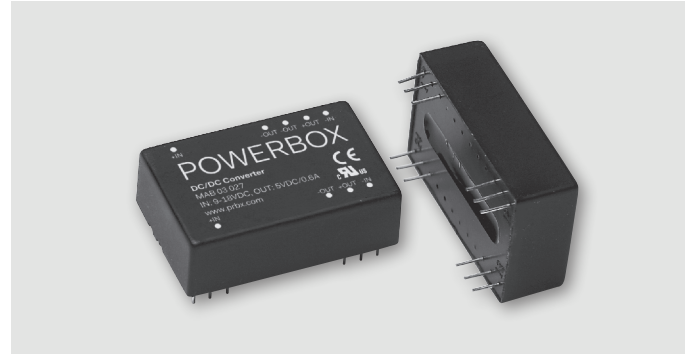
Regulated output

Pi input filter

Continuous short circuit protection

Meet EN55055 class B , conducted

Remote on/off option



| Model Number | Input Voltage | Output Voltage | Output Current | Input Current | | Efficiency |
|--------------|---------------|----------------|----------------|---------------|-----------|------------|
| | | | | No Load | Full Load | |
| MAB 03 024 | 9-18 VDC | 3.3 VDC | 600 mA | 7.5 mA | 229 mA | 72% |
| MAB 03 027 | 9-18 VDC | 5 VDC | 600 mA | 7.5 mA | 329 mA | 76% |
| MAB 03 030 | 9-18 VDC | 12 VDC | 250 mA | 7.5 mA | 316 mA | 79% |
| MAB 03 033 | 9-18 VDC | 15 VDC | 200 mA | 7.5 mA | 321 mA | 78% |
| MAB 03 036 | 9-18 VDC | ±5 VDC | ±300 mA | 12 mA | 329 mA | 76% |
| MAB 03 039 | 9-18 VDC | ±12 VDC | ±125 mA | 12 mA | 325 mA | 77% |
| MAB 03 042 | 9-18 VDC | ±15 VDC | ±100 mA | 12 mA | 329 mA | 76% |
| MAB 03 045 | 18-36 VDC | 3.3 VDC | 600 mA | 5 mA | 111 mA | 74% |
| MAB 03 048 | 18-36 VDC | 5 VDC | 600 mA | 5 mA | 162 mA | 77% |
| MAB 03 051 | 18-36 VDC | 12 VDC | 250 mA | 5 mA | 156 mA | 80% |
| MAB 03 054 | 18-36 VDC | 15 VDC | 200 mA | 5 mA | 156 mA | 80% |
| MAB 03 057 | 18-36 VDC | ±5 VDC | ±300 mA | 7.5 mA | 164 mA | 76% |
| MAB 03 060 | 18-36 VDC | ±12 VDC | ±125 mA | 7.5 mA | 156 mA | 80% |
| MAB 03 063 | 18-36 VDC | ±15 VDC | ±100 mA | 7.5 mA | 162 mA | 77% |
| MAB 03 066 | 36-72 VDC | 3.3 VDC | 600 mA | 3 mA | 58 mA | 71% |
| MAB 03 069 | 36-72 VDC | 5 VDC | 600 mA | 2 mA | 81 mA | 77% |
| MAB 03 072 | 36-72 VDC | 12 VDC | 250 mA | 2 mA | 81 mA | 77% |
| MAB 03 075 | 36-72 VDC | 15 VDC | 200 mA | 2 mA | 81 mA | 77% |
| MAB 03 078 | 36-72 VDC | ±5 VDC | ±300 mA | 3 mA | 80 mA | 78% |
| MAB 03 081 | 36-72 VDC | ±12 VDC | ±125 mA | 3 mA | 82 mA | 76% |
| MAB 03 084 | 36-72 VDC | ±15 VDC | ±100 mA | 3 mA | 82 mA | 76% |

Note:

1. Nominal input voltage 12, 24 or 48 VDC

2. All specifications typical at nominal line , full load and 25oC unless otherwise notes.

Specifications

Input Specifications

| Parameters | Min | Nominal | Max | Unit | Note |
|---------------------|-----|---------|-----|------|-----------|
| Input voltage range | 9 | 12 | 18 | VDC | |
| | 18 | 24 | 36 | VDC | |
| | 36 | 48 | 72 | VDC | |
| Input filter | | | | | Pi-filter |

Output Specifications

| Parameters | Max | Unit | Note |
|--------------------------------|------|-------|----------------------------|
| Voltage accuracy | 2.0 | % | |
| Voltage balance (Dual) | 1.0 | % | |
| Temperature coefficient | 0.05 | %/ oC | |
| Ripple and noise 20MHz BW | 100 | mVp-p | 3.3V, 5V output |
| | 1% | Vp-p | 12V, 15V output |
| Short circuit protection | | | Continuous |
| Line regulation, single/dual | 0.5 | % | From high line to low line |
| Load regulation, single | 0.5 | % | From full load to 10% load |
| | 1 | % | From full load to 25% load |
| EMI- EN55022 Class B conducted | | | |

General Specifications

| Parameters | Min | Max | Unit | Note |
|--------------------------------|--|------|------|--|
| Isolation resistance | 10 ⁹ | | Ohms | |
| Switching frequency | 100 | | KHz | |
| Operating temperature range | -25 | +71 | oC | |
| Case temperature | | +95 | oC | Plastic case |
| | | +100 | | Copper case |
| Cooling | | | | Free air convection |
| Storage temperature range | -40 | +100 | oC | |
| Case material, standard models | | | | Non-conductive black plastic |
| Suffix "M" models | | | | Black coated copper with non-conductive base |
| Case dimensions | 1.25 x 0.8 x 0.5 inches (31.8 x 20.3 x 12.7 mm) | | | |

Isolation Voltage

| | | | |
|-----------------------------------|------|-----|--------------------|
| Input to output Isolation voltage | 500 | VDC | Standard models |
| | 1500 | VDC | Suffix "HM" models |
| | 3000 | VDC | Suffix "H" models |

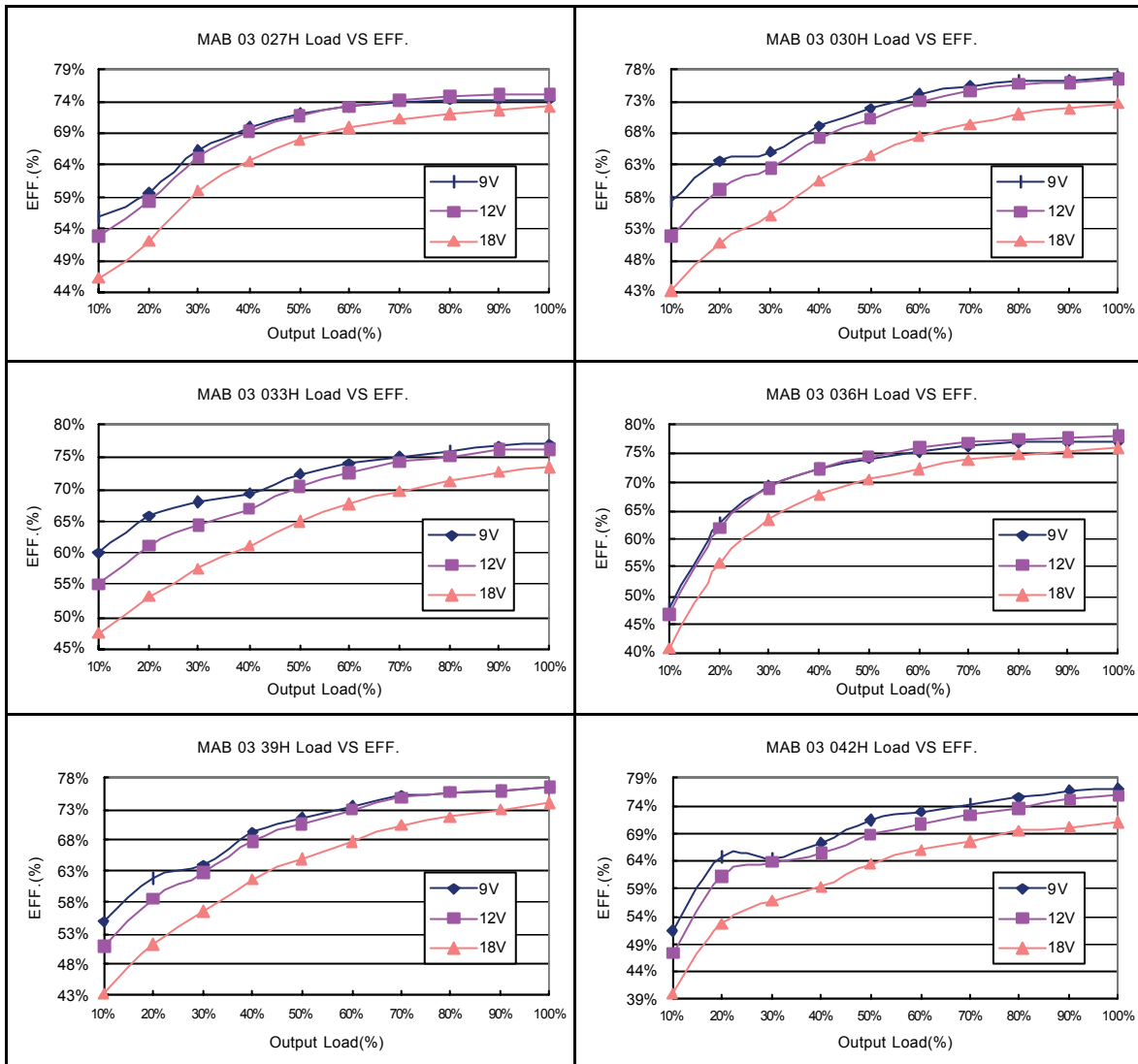
Remote On/Off Control

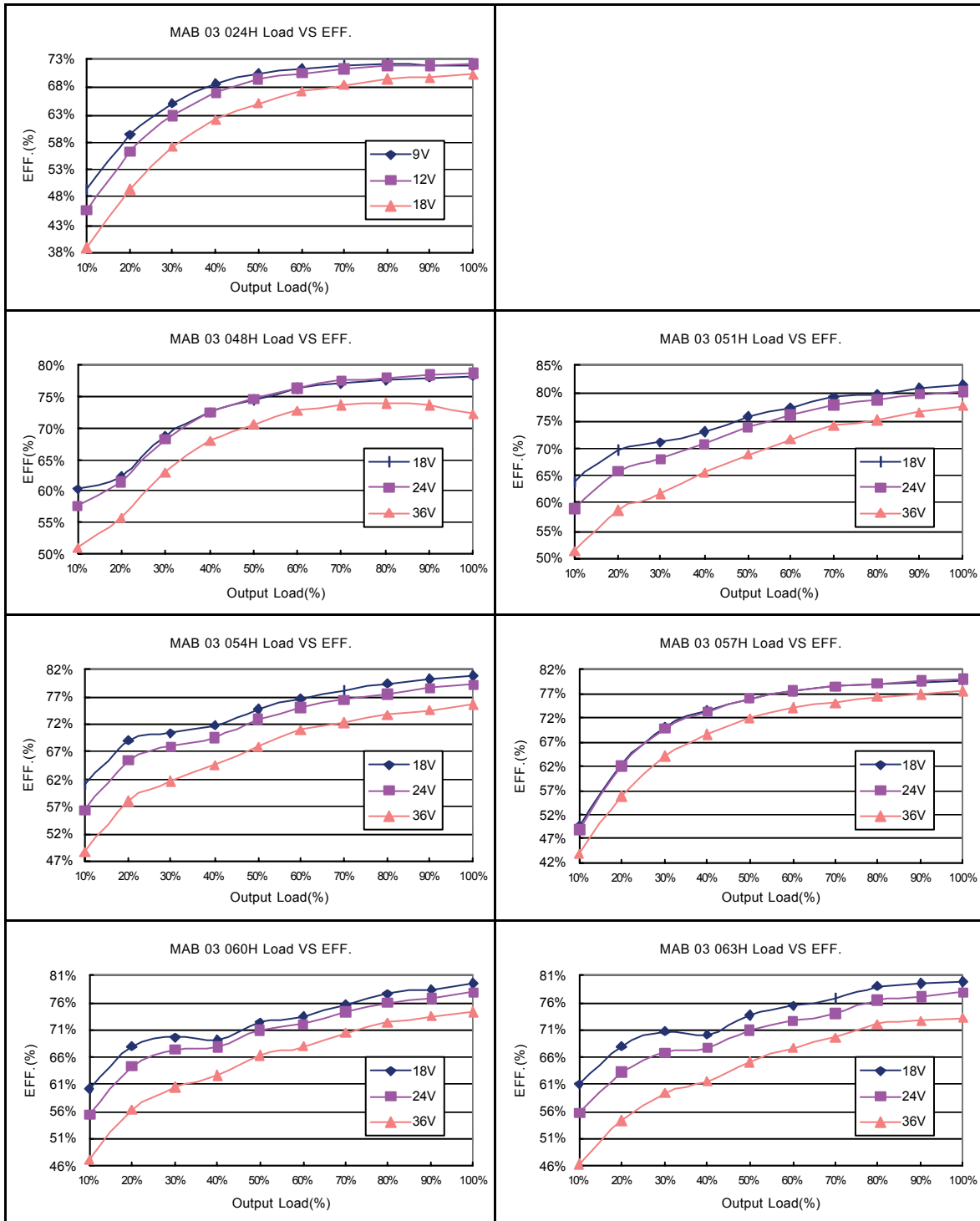
| Parameters | Note |
|--|----------------------------|
| Logic compatibility | CMOS or open collector TTL |
| Ec-on | >+5.5Vdc or open circuit |
| Ec-off | <1.8Vdc |
| Shutdown idle current | 10mA |
| Control common | Referenced to input minus |
| Suffix "T" to the model number with remote on/off for "H" / "HM" versions only | |

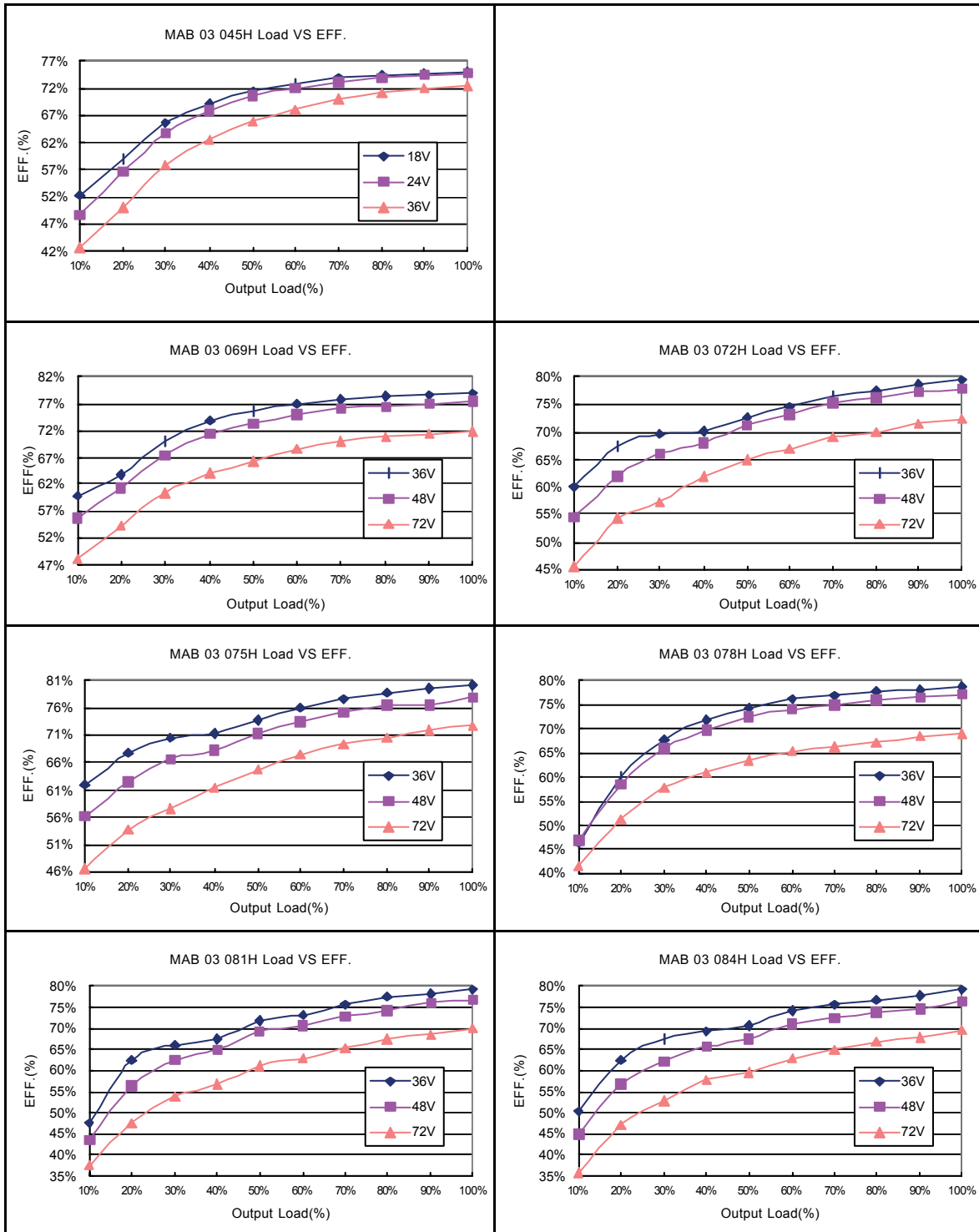
General Information

The MAB03 unit has many operational characterized aspects, including efficiency, start up delay time, overshoot, output ripple & noise, dynamic response to load and EMI- EN55022 Class B conducted curve.

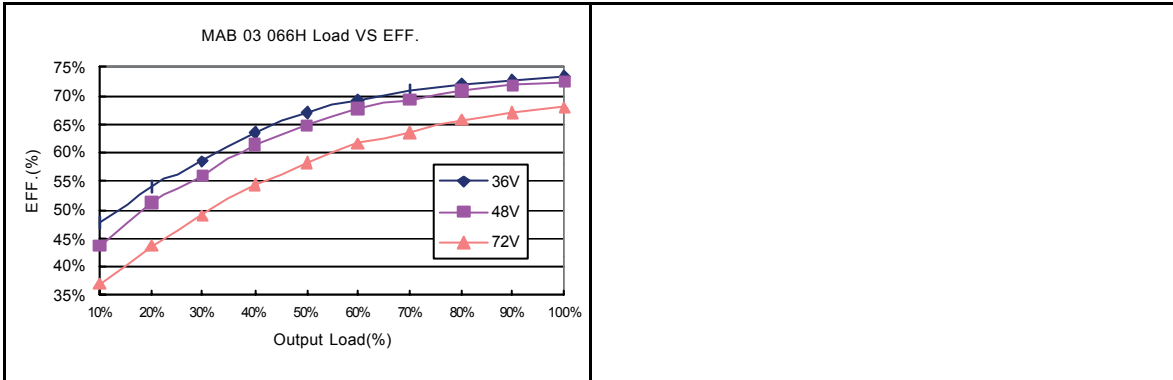
Efficiency





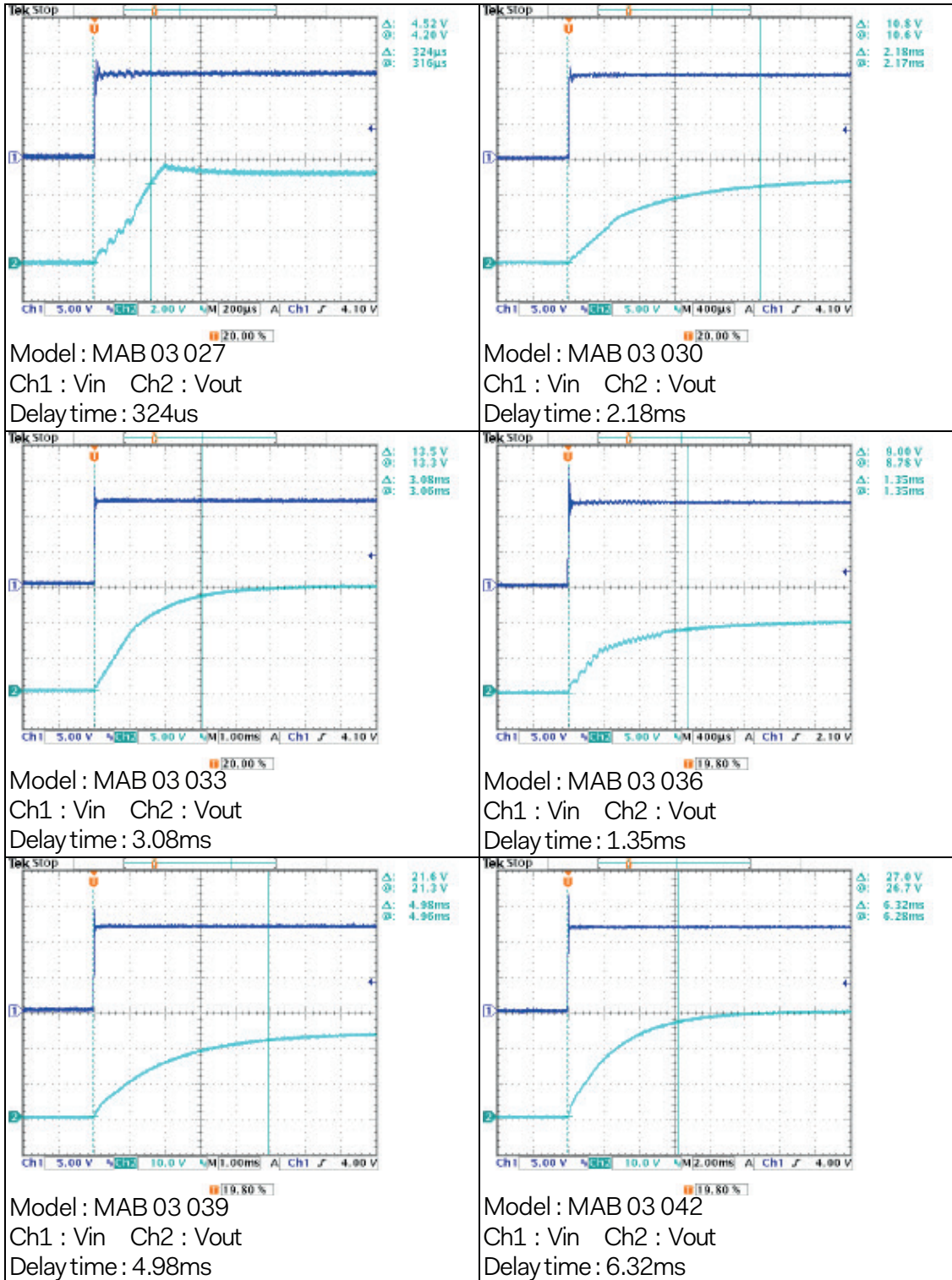


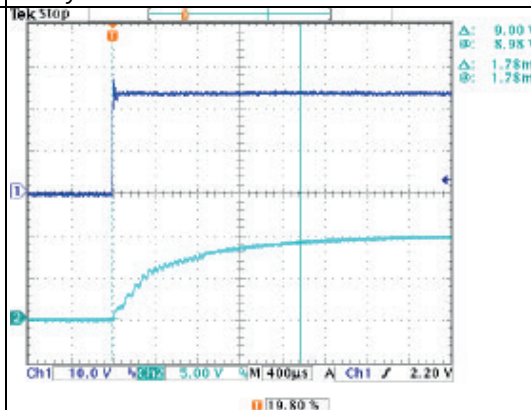
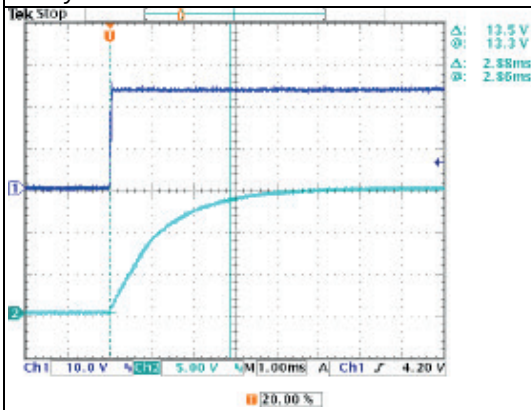
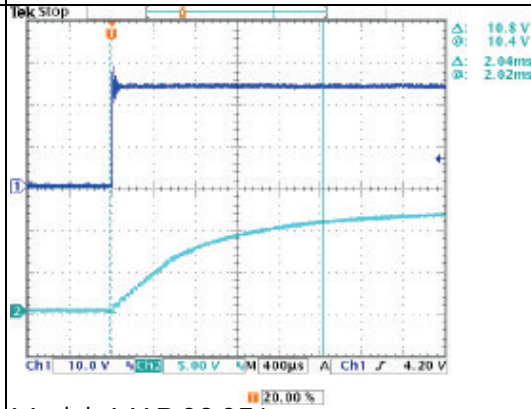
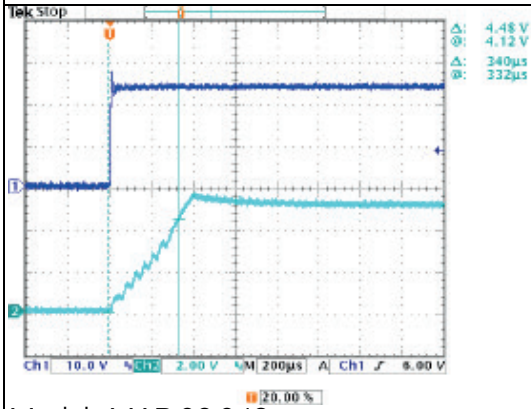
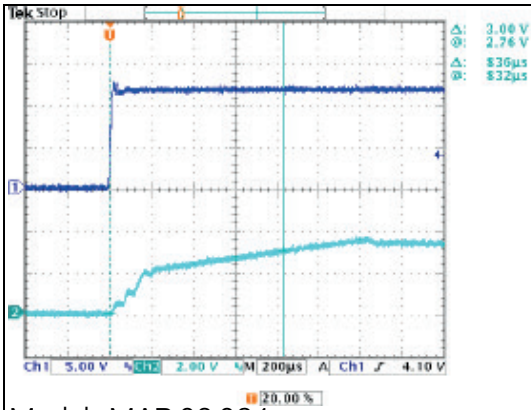
POWERBOX Industrial Line
MAB03 Series
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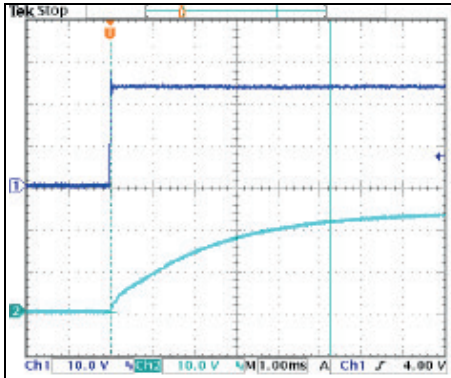


Start Up Delay Time

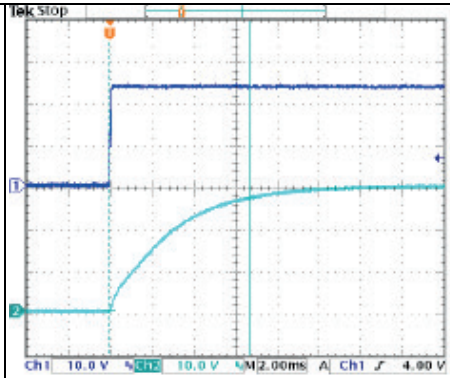
Start up input power, measuring the time between input power is turn on and output voltage go within 90% Vout. At nominal input and maximum load.



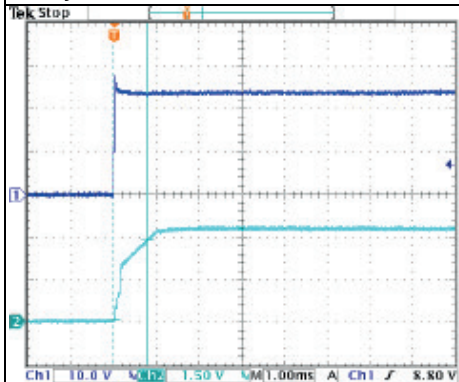




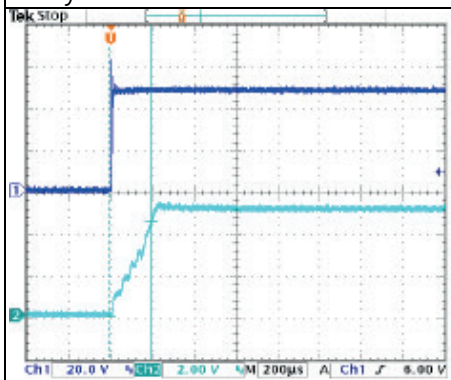
Model : MAB 03 060
Ch1 : Vin Ch2 : Vout
Delay time : 5.26ms



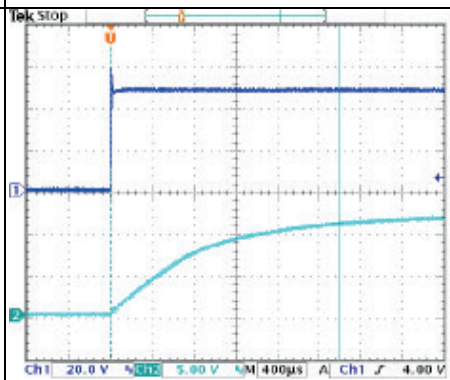
Model : MAB 03 063
Ch1 : Vin Ch2 : Vout
Delaytime : 6.76ms



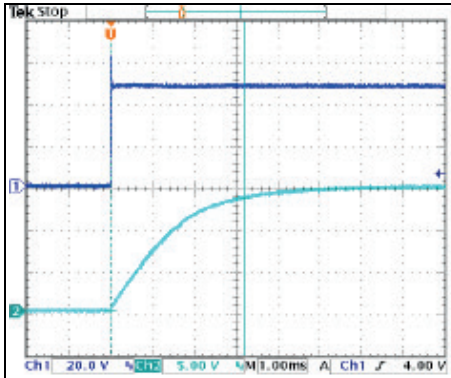
Model : MAB 03 045
Ch1 : Vin Ch2 : Vout
Delaytime : 800µs



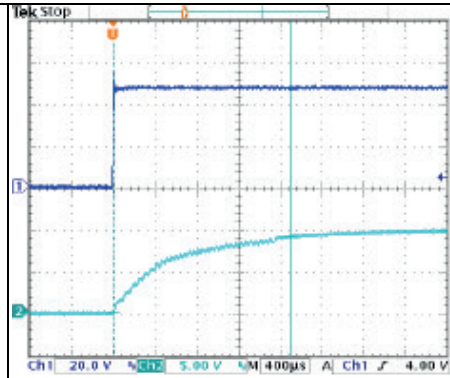
Model : MAB 03 069
Ch1 : Vin Ch2 : Vout
Delaytime : 200µs



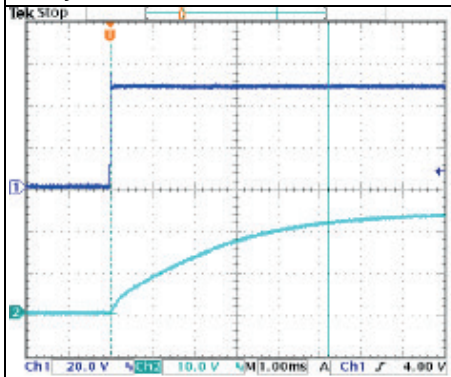
Model : MAB 03 072
Ch1 : Vin Ch2 : Vout
Delaytime : 2.19ms



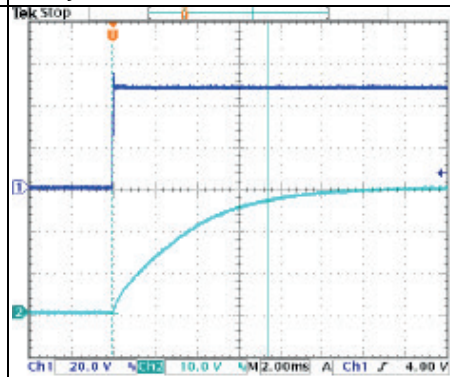
Model : MAB 03 075
Ch1 : Vin Ch2 : Vout
Delaytime : 3.22ms



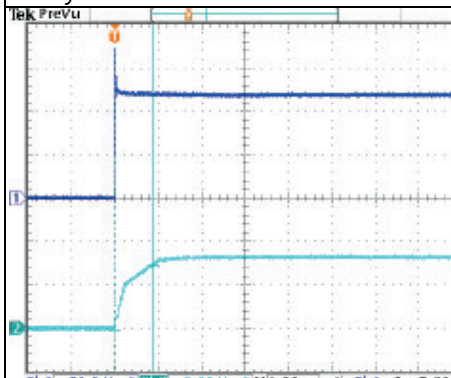
Model : MAB 03 078
Ch1 : Vin Ch2 : Vout
Delaytime : 1.70ms



Model : MAB 03 081
Ch1 : Vin Ch2 : Vout
Delaytime : 5.24ms



Model : MAB 03 084
Ch1 : Vin Ch2 : Vout
Delaytime : 7.48ms



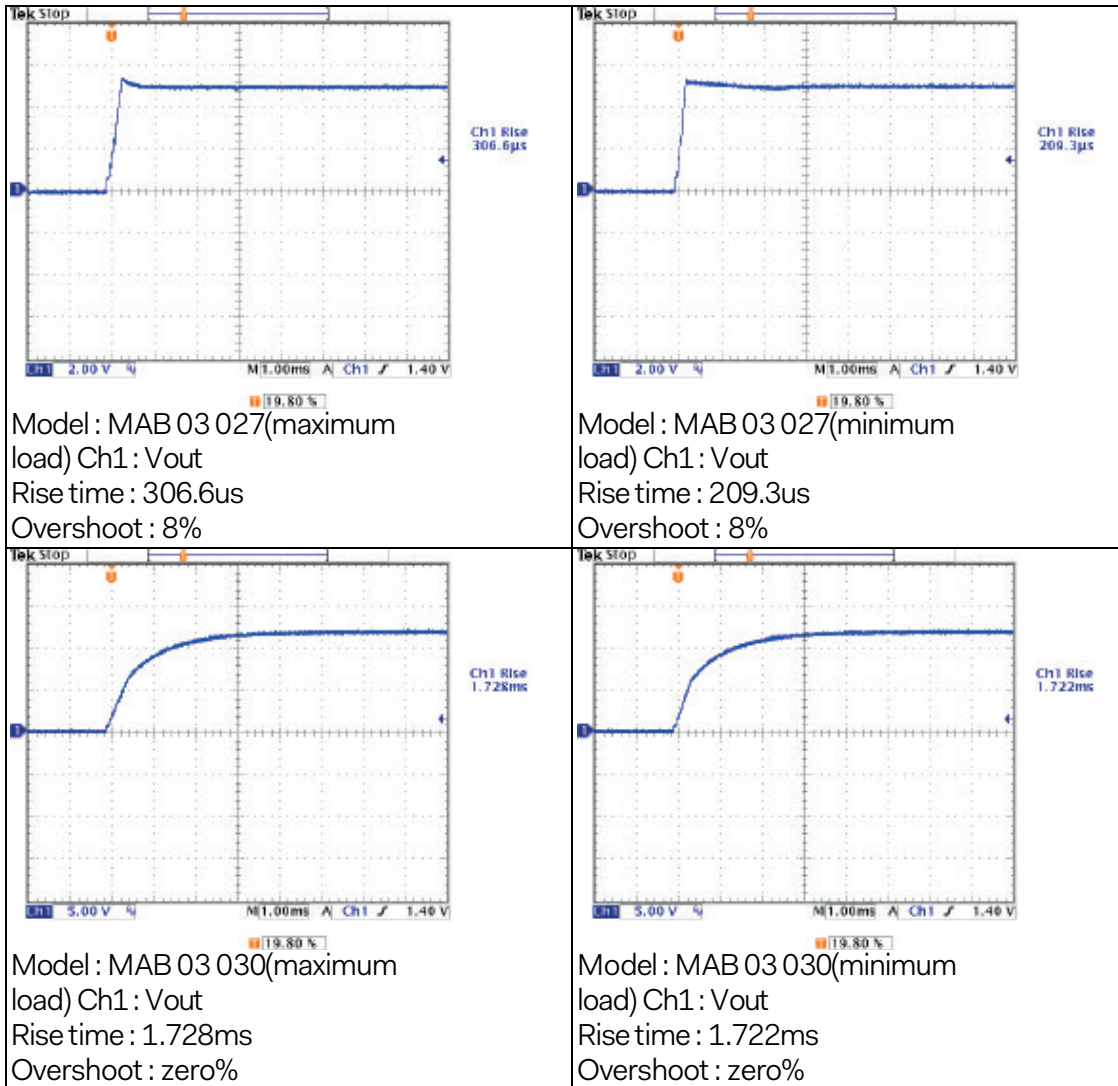
Model : MAB 03 066
Ch1 : Vin Ch2 : Vout
Delaytime : 900us

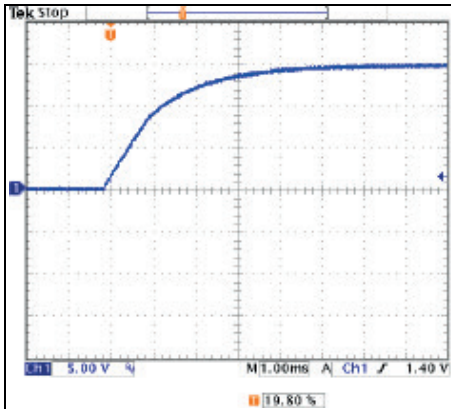
Overshoot

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

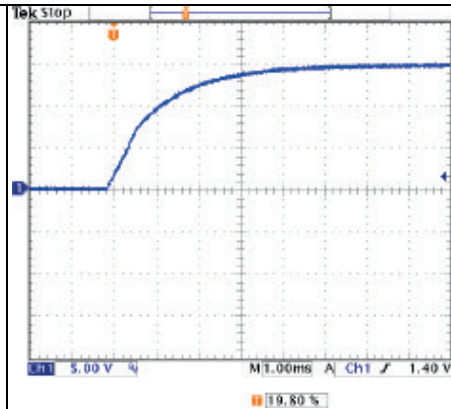
Rise Time

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

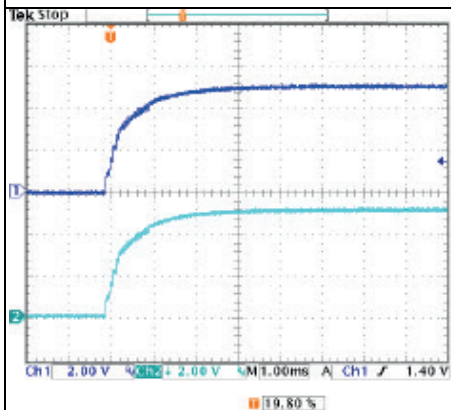




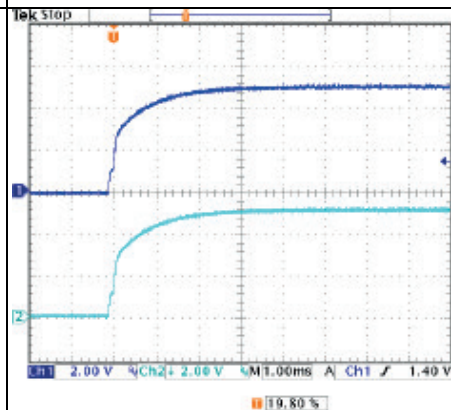
Model : MAB 03 033(maximum load) Ch1 : Vout
Rise time : 2.667ms
Overshoot : zero%



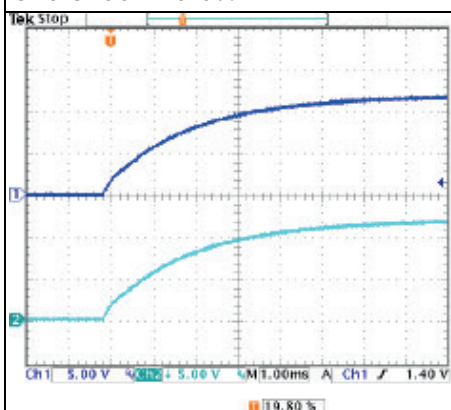
Model : MAB 03 033(minimum load) Ch1 : Vout
Rise time : 2.535ms
Overshoot : zero%



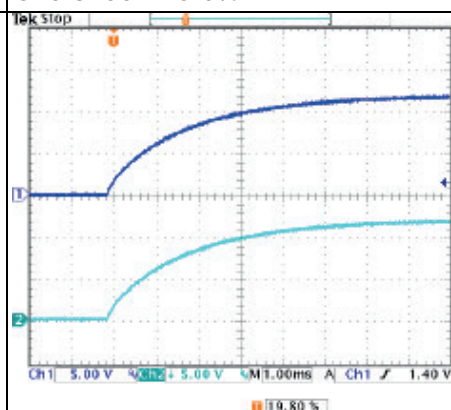
Model : MAB 03 036(maximum load) Ch1 : +Vout Ch2 : -Vout
Rise time : 1.274ms / 1.385ms
Overshoot : zero%



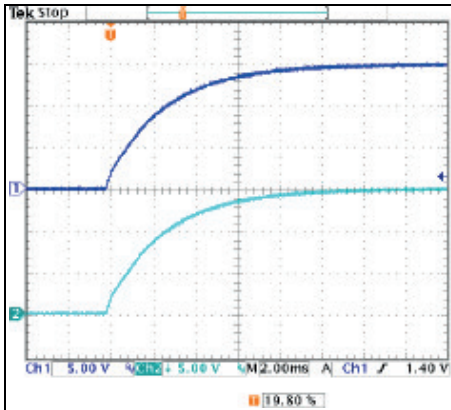
Model : MAB 03 036(minimum load) Ch1 : +Vout Ch2 : -Vout
Rise time : 1.279ms / 1.390ms
Overshoot : zero%



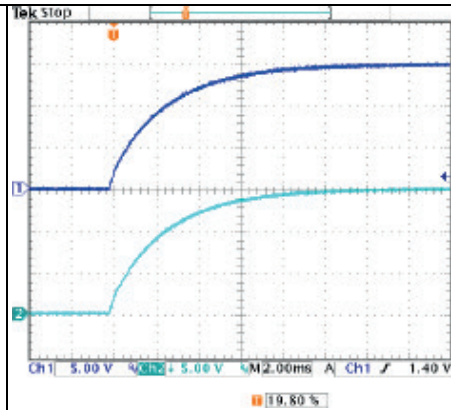
Model : MAB 03 039(maximum load) Ch1 : +Vout Ch2 : -Vout
Rise time : 3.500ms / 3.700ms
Overshoot : zero%



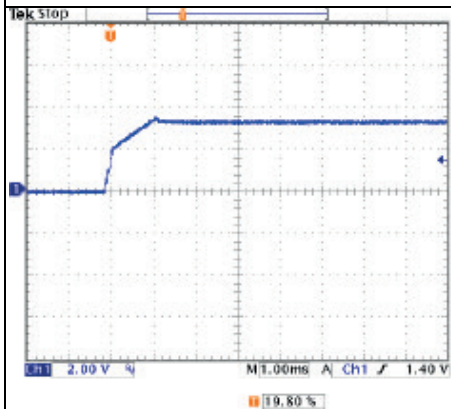
Model : MAB 03 039(minimum load) Ch1 : +Vout Ch2 : -Vout
Rise time : 3.657ms / 3.584ms
Overshoot : zero%



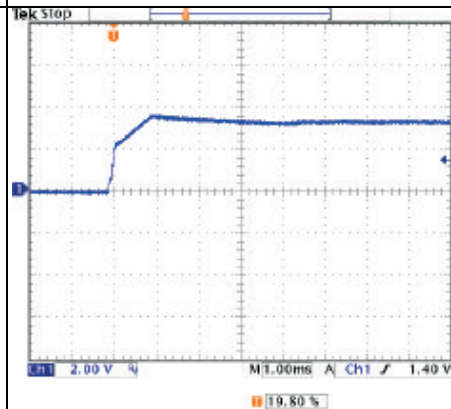
Model : MAB 03 042(maximum load) Ch1 : +Vout Ch2 : -Vout
Rise time : 5.662ms / 5.681ms
Overshoot : zero%



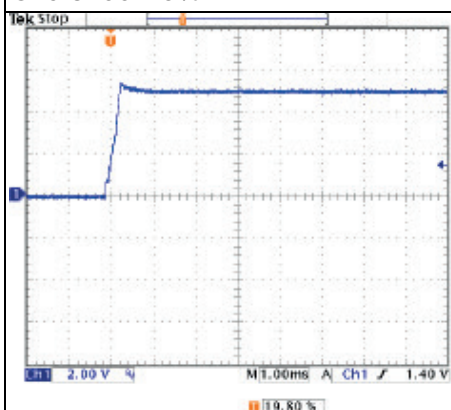
Model : MAB 03 042(minimum load) Ch1 : +Vout Ch2 : -Vout
Rise time : 5.343ms / 5.465ms
Overshoot : zero%



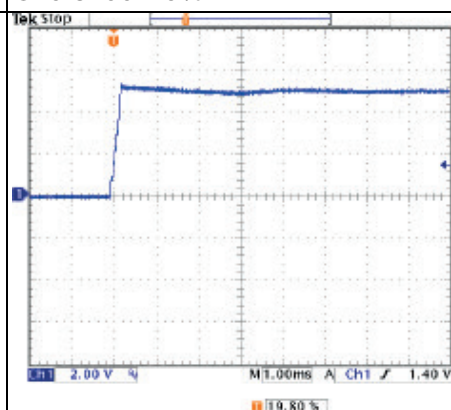
Model : MAB 03 024(maximum load) Ch1 : Vout
Rise time : 812.2µs
Overshoot : 9%



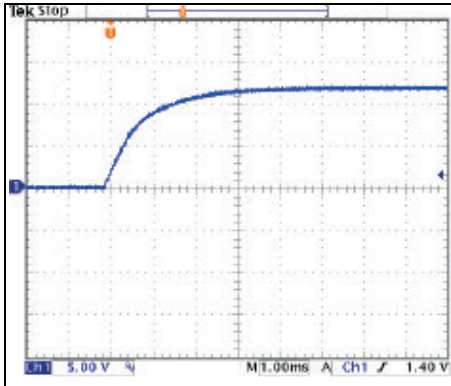
Model : MAB 03 024(minimum load) Ch1 : Vout
Rise time : 640.0µs
Overshoot : 9%



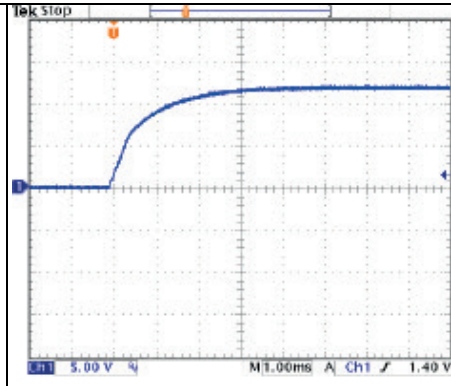
Model : MAB 03 048(maximum load) Ch1 : Vout
Rise time : 302.3µs
Overshoot : 8%



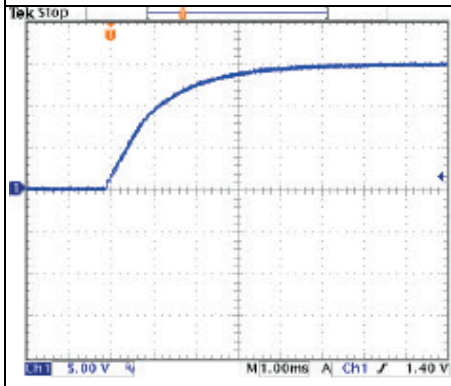
Model : MAB 03 048(minimum load) Ch1 : Vout
Rise time : 214.2µs
Overshoot : 8%



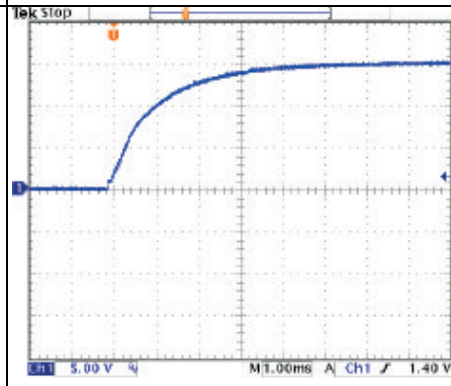
Model : MAB 03 051(maximum load) Ch1 : Vout
Rise time : 1.768ms
Overshoot : zero%



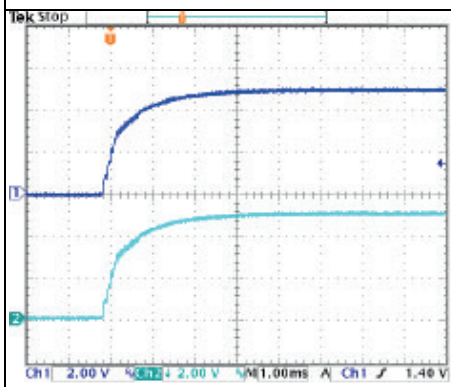
Model : MAB 03 051(minimum load) Ch1 : Vout
Rise time : 1.850ms
Overshoot : zero%



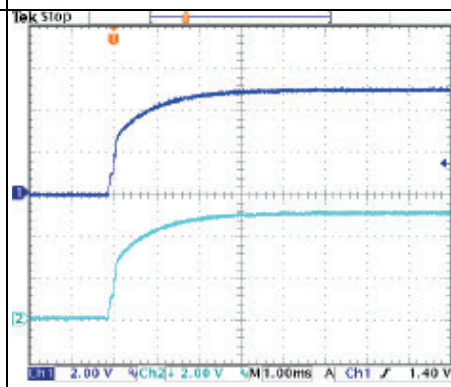
Model : MAB 03 054(maximum load) Ch1 : Vout
Rise time : 2.398ms
Overshoot : zero%



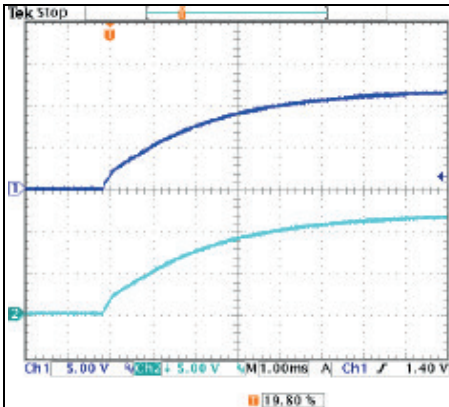
Model : MAB 03 054(minimum load) Ch1 : Vout
Rise time : 2.494ms
Overshoot : zero%



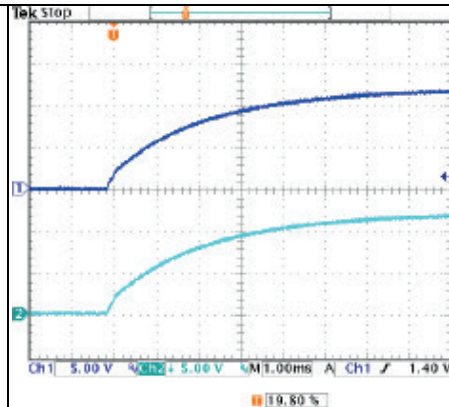
Model : MAB 03 057(maximum load) Ch1 : +Vout Ch2 : -Vout
Rise time : 1.476ms / 1.476ms
Overshoot : zero%



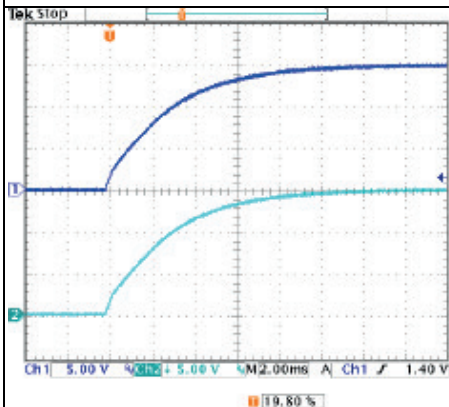
Model : MAB 03 057(minimum load) Ch1 : +Vout Ch2 : -Vout
Rise time : 1.415ms / 1.538ms
Overshoot : zero%



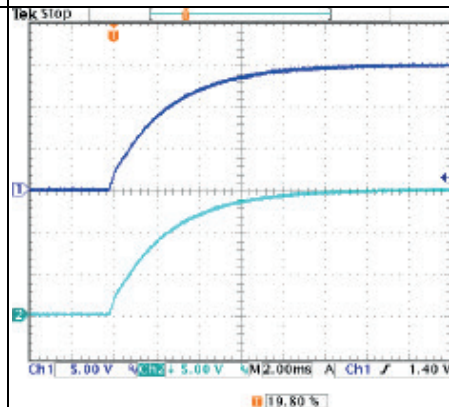
Model : MAB 03 060(maximum load) Ch1 : +Vout Ch2 : -Vout
Rise time : 4.017ms / 4.230ms
Overshoot : zero%



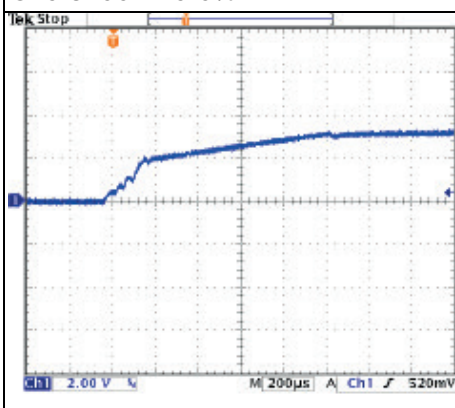
Model : MAB 03 060(minimum load) Ch1 : +Vout Ch2 : -Vout
Rise time : 3.907ms / 4.022ms
Overshoot : zero%



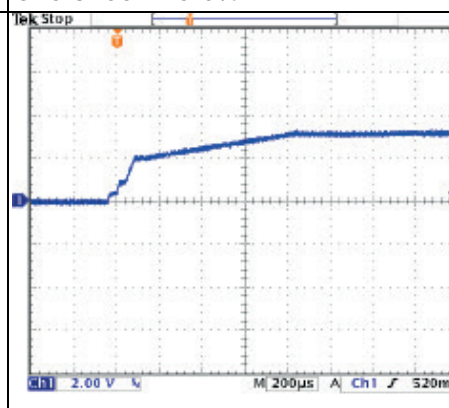
Model : MAB 03 063(maximum load) Ch1 : +Vout Ch2 : -Vout
Rise time : 5.966ms / 6.142ms
Overshoot : zero%



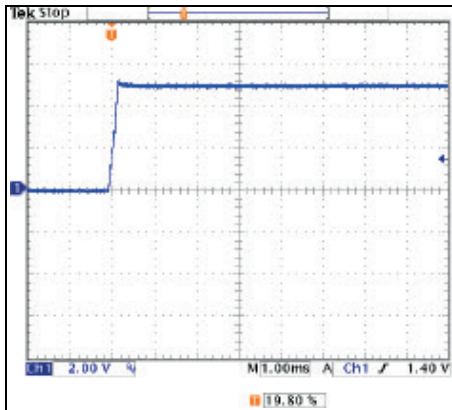
Model : MAB 03 063(minimum load) Ch1 : +Vout Ch2 : -Vout
Rise time : 5.474ms / 5.538ms
Overshoot : zero%



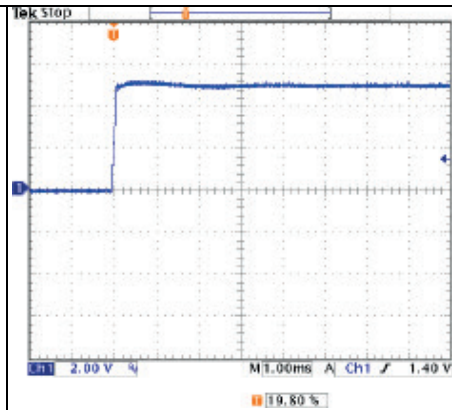
Model : MAB 03 045(maximum load) Ch1 : Vout
Rise time : 844.8µs
Overshoot : zero%



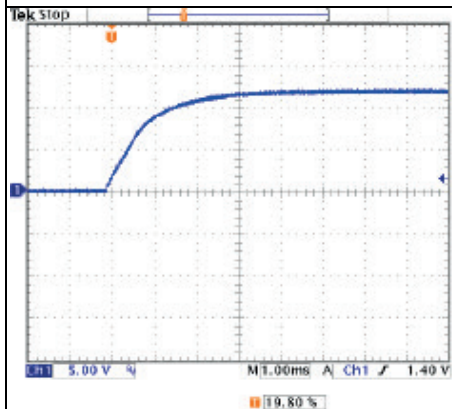
Model : MAB 03 045(minimum load) Ch1 : Vout
Rise time : 706.9µs
Overshoot : zero%



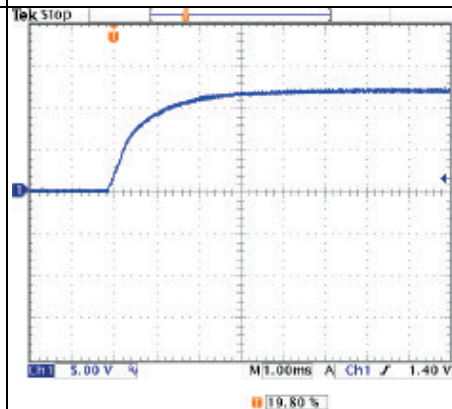
Model : MAB 03 069(maximum load) Ch1 : Vout
Rise time : 187.6us
Overshoot : 8%



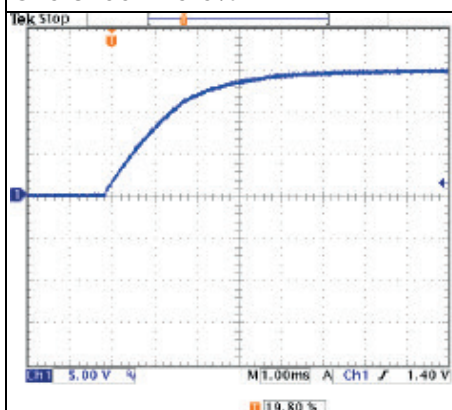
Model : MAB 03 069(minimum load) Ch1 : Vout
Rise time : 105.0us
Overshoot : 4%



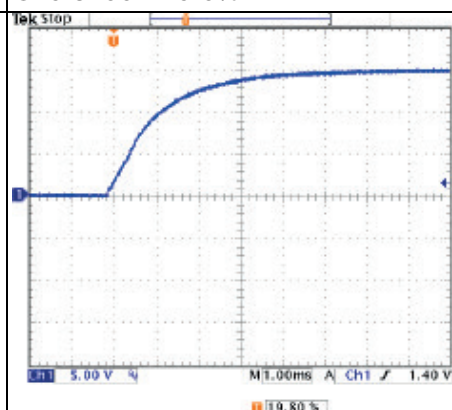
Model : MAB 03 072(maximum load) Ch1 : Vout
Rise time : 1.884ms
Overshoot : zero%



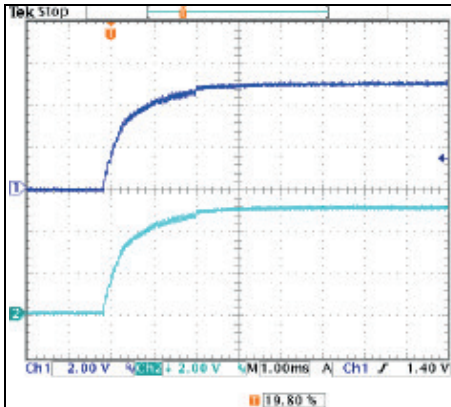
Model : MAB 03 072(minimum load) Ch1 : Vout
Rise time : 1.789ms
Overshoot : zero%



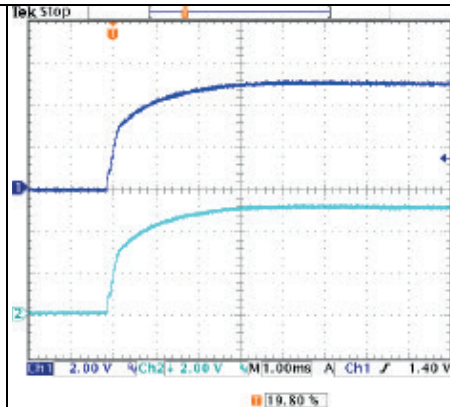
Model : MAB 03 075(maximum load) Ch1 : Vout
Rise time : 2.665ms
Overshoot : zero%



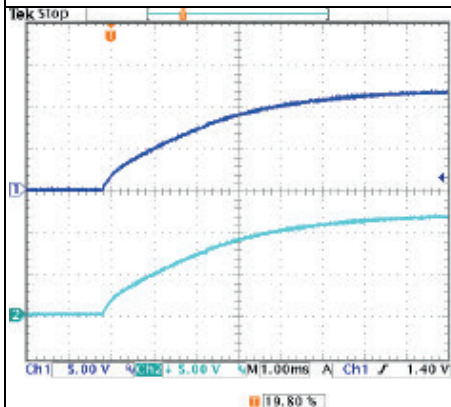
Model : MAB 03 075(minimum load) Ch1 : Vout
Rise time : 2.445ms
Overshoot : zero%



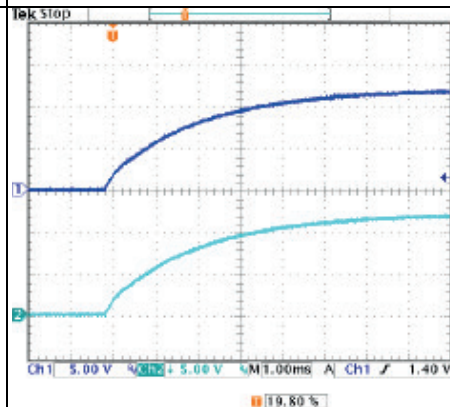
Model : MAB 03 078(maximum load) Ch1 : +Vout Ch2 : -Vout
Rise time : 1.403ms / 1.544ms
Overshoot : zero%



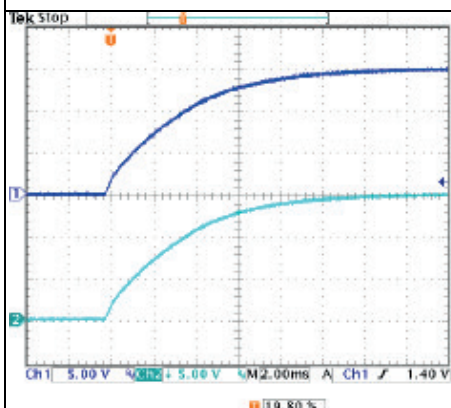
Model : MAB 03 078(minimum load) Ch1 : +Vout Ch2 : -Vout
Rise time : 1.574ms / 1.608ms
Overshoot : zero%



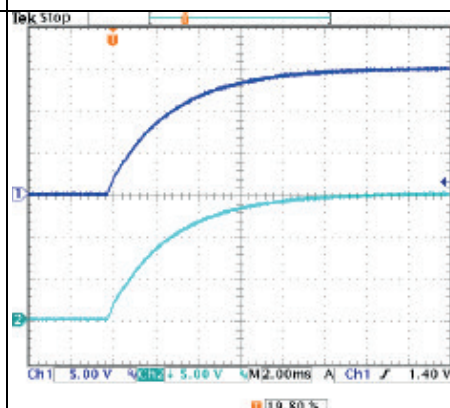
Model : MAB 03 081(maximum load) Ch1 : +Vout Ch2 : -Vout
Rise time : 4.032ms / 4.219ms
Overshoot : zero%



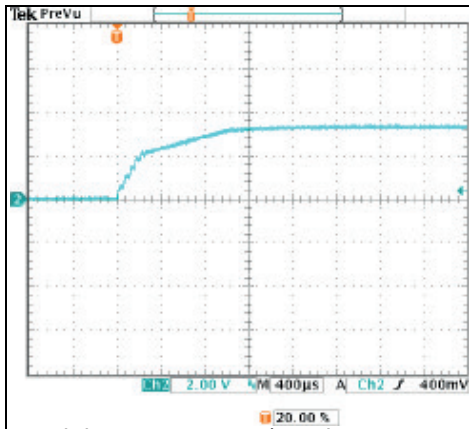
Model : MAB 03 081(minimum load) Ch1 : +Vout Ch2 : -Vout
Rise time : 4.162ms / 4.037ms
Overshoot : zero%



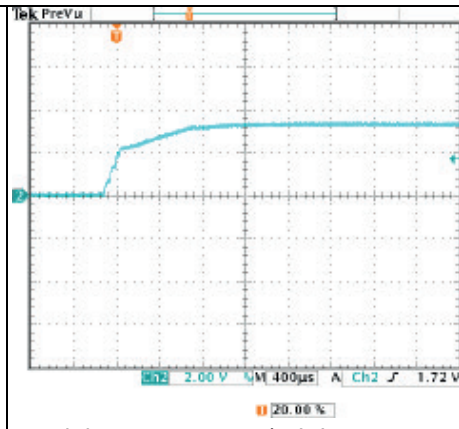
Model : MAB 03 084(maximum load) Ch1 : +Vout Ch2 : -Vout
Rise time : 6.660ms / 6.919ms
Overshoot : zero%



Model : MAB 03 084(minimum load) Ch1 : +Vout Ch2 : -Vout
Rise time : 6.192ms / 6.214ms
Overshoot : zero%



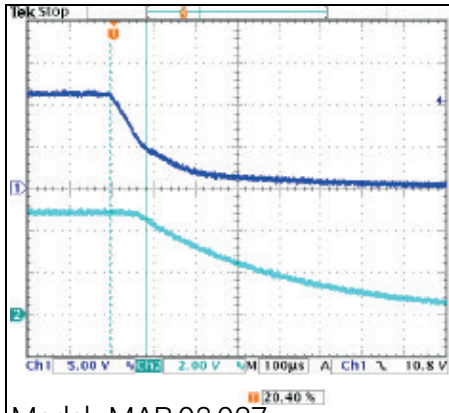
Model : MAB 03 066(maximum load) Ch1 : Vout
Rise time : 769.9us
Overshoot : zero%



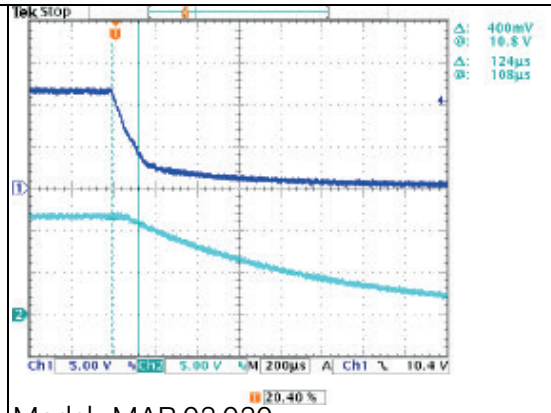
Model : MAB 03 066(minimum load) Ch1 : Vout
Rise time : 651.1us
Overshoot : zero%

Hold Time

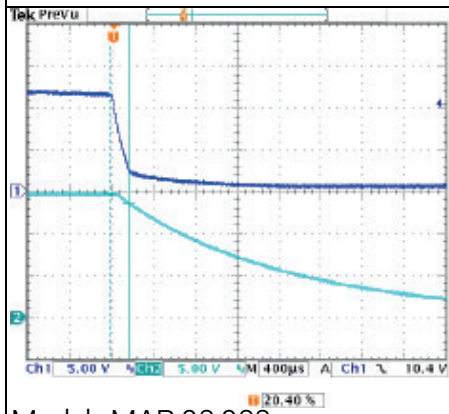
Measure from the power supply end to when Vout drop down to 90% output .At nominal input and maximum load.



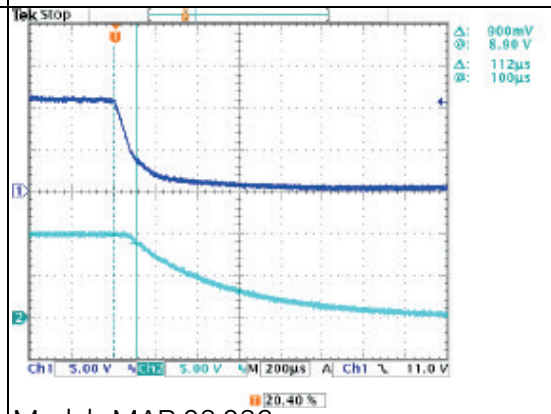
Model : MAB 03 027
Ch1 : Vin Ch2 : Vout
Hold time : 88.0us



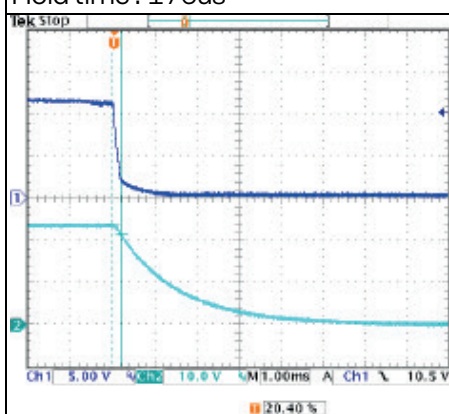
Model : MAB 03 030
Ch1 : Vin Ch2 : Vout
Hold time : 124.0us



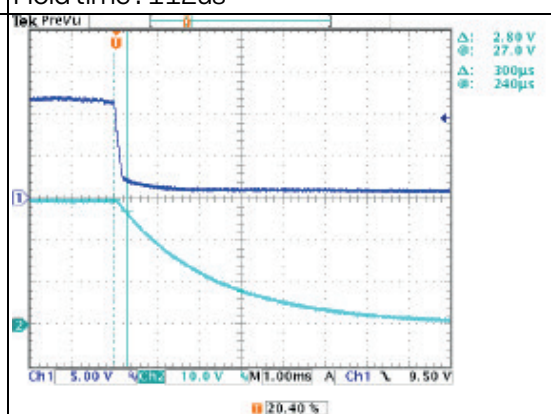
Model : MAB 03 033
Ch1 : Vin Ch2 : Vout
Hold time : 176us



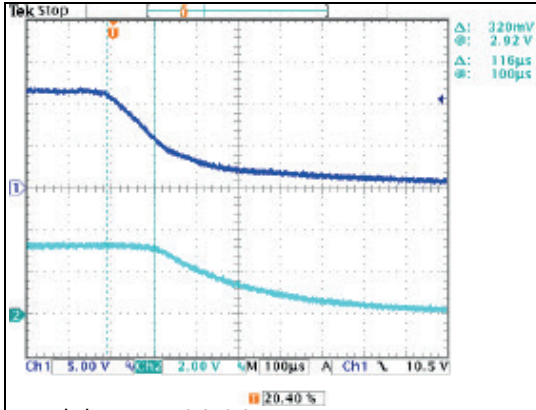
Model : MAB 03 036
Ch1 : Vin Ch2 : Vout
Hold time : 112us



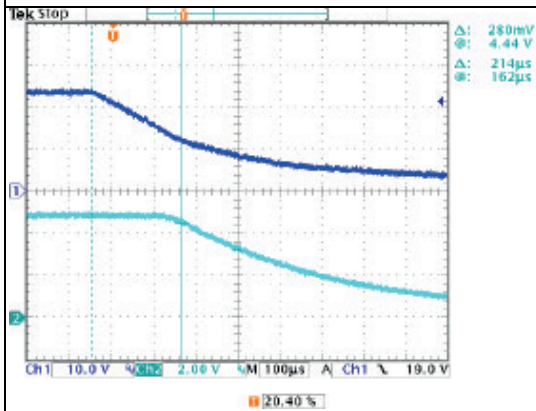
Model : MAB 03 039
Ch1 : Vin Ch2 : Vout
Hold time : 220us



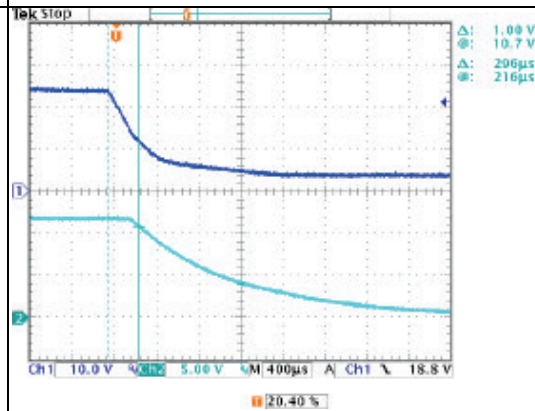
Model : MAB 03 042
Ch1 : Vin Ch2 : Vout
Hold time : 300us



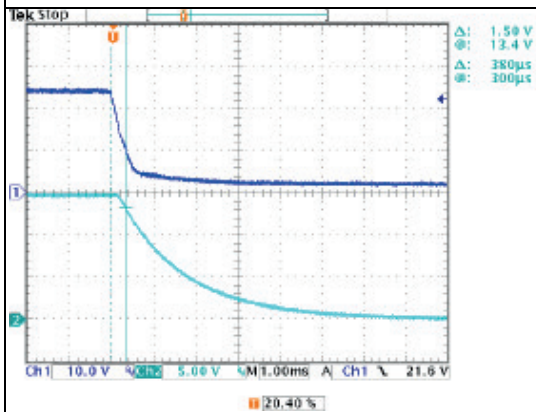
Model : MAB 03 024
Ch1 : Vin Ch2 : Vout
Hold time : 116µs



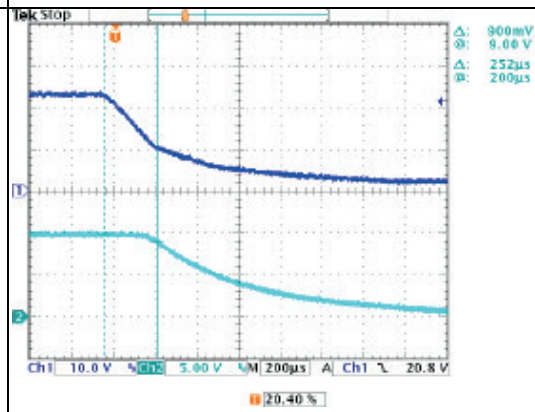
Model : MAB 03 048
Ch1 : Vin Ch2 : Vout
Hold time : 214µs



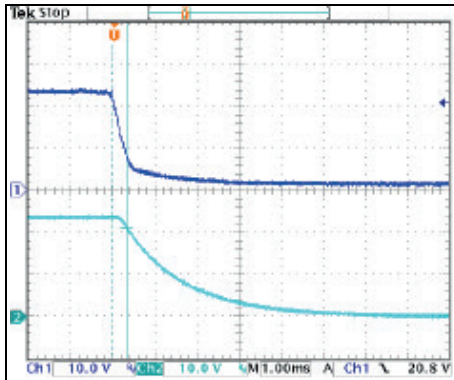
Model : MAB 03 051
Ch1 : Vin Ch2 :
Vout Hold time :



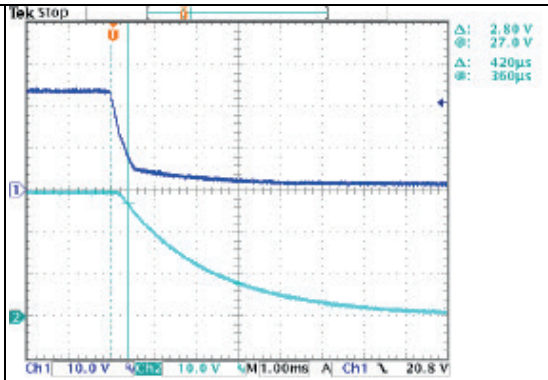
Model : MAB 03 054
Ch1 : Vin Ch2 : Vout
Hold time : 380µs



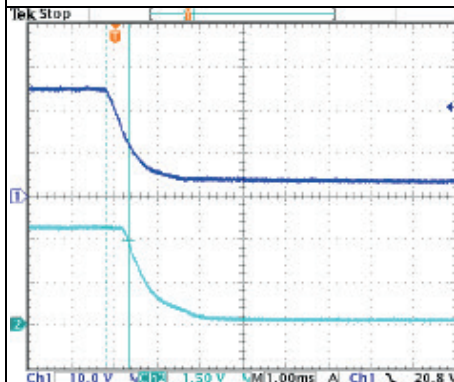
Model : MAB 03 057
Ch1 : Vin Ch2 : Vout
Hold time : 252µs



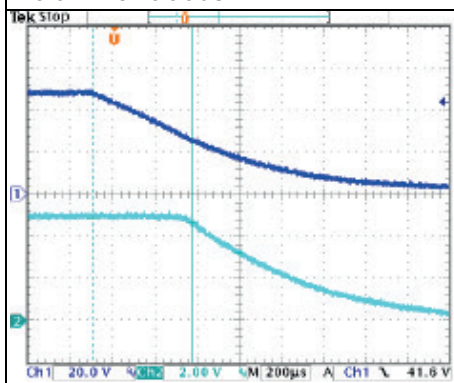
Model : MAB 03 060
Ch1 : Vin Ch2 : Vout
Hold time : 340us



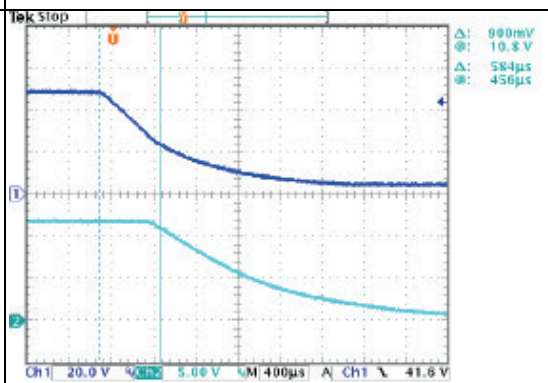
Model : MAB 03 063
Ch1 : Vin Ch2 : Vout
Hold time : 420us



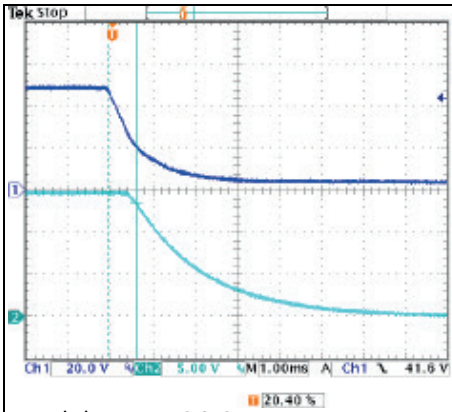
Model : MAB 03 045
Ch1 : Vin Ch2 : Vout
Hold time : 500us



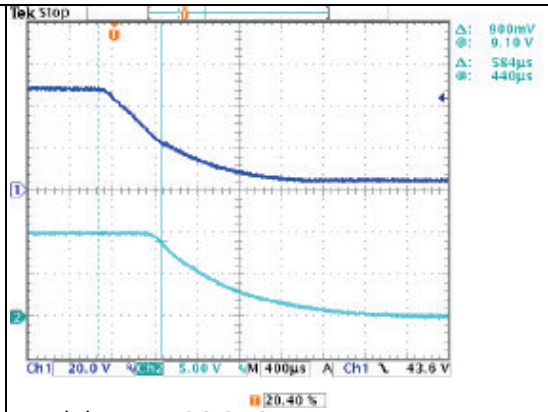
Model : MAB 03 069
Ch1 : Vin Ch2 : Vout
Hold time : 476us



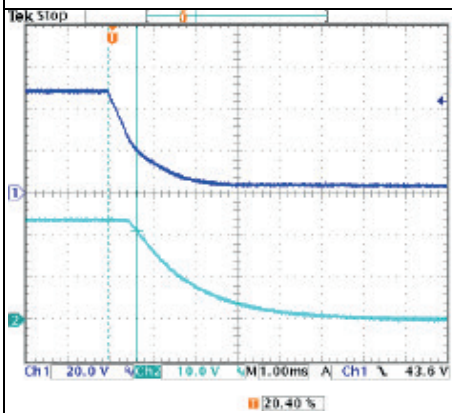
Model : MAB 03 072
Ch1 : Vin Ch2 : Vout
Hold time : 584us



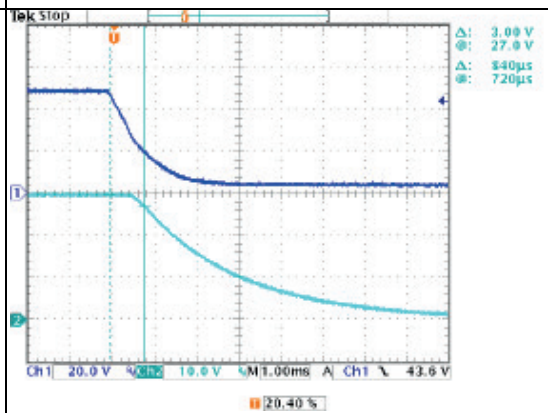
Model : MAB 03 075
Ch1 : Vin Ch2 : Vout
Hold time : 680us



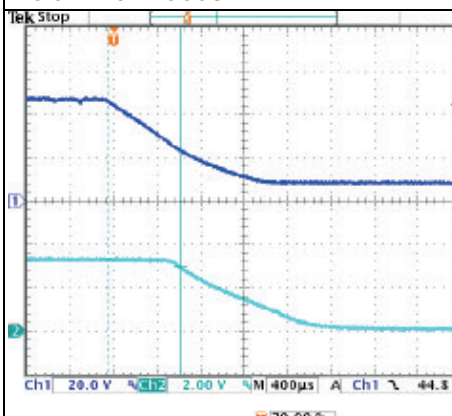
Model : MAB 03 078
Ch1 : Vin Ch2 : Vout
Hold time : 584us



Model : MAB 03 081
Ch1 : Vin Ch2 : Vout
Hold time : 700us



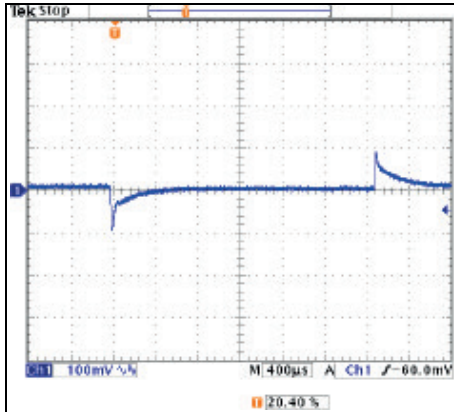
Model : MAB 03 084
Ch1 : Vin Ch2 : Vout
Hold time : 840us



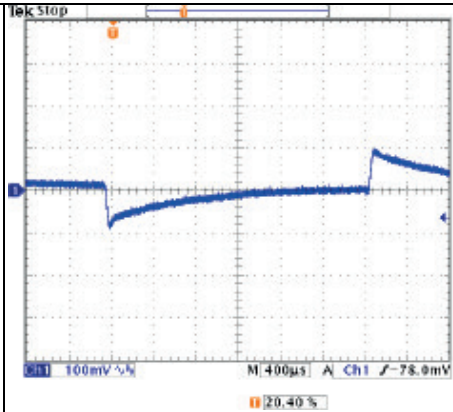
Model : MAB 03 066
Ch1 : Vin Ch2 : Vout
Hold time : 680us

Dynamic Response

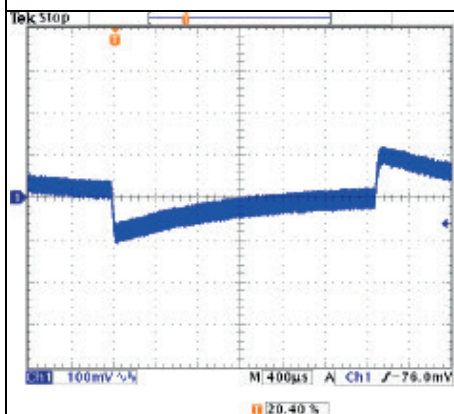
Output voltage dynamic response at nominal input and different load condition (load change 75% load to 100% load).
Load current=0.1A/us, Ton=Toff=2.5ms



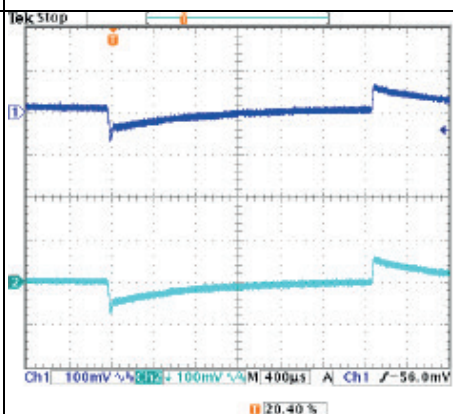
Model : MAB 03 027
Ch1 : Vout



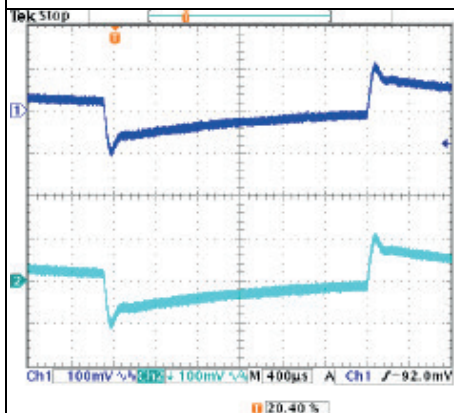
Model : MAB 03 030
Ch1 : Vout



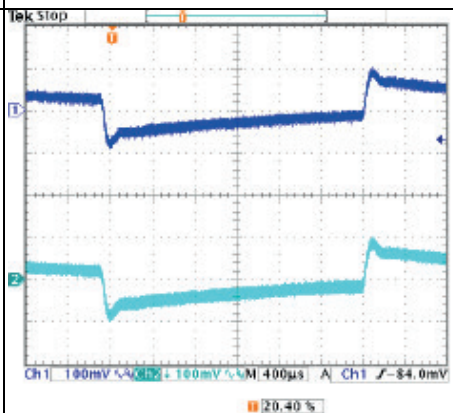
Model : MAB 03 033
Ch1 : Vout



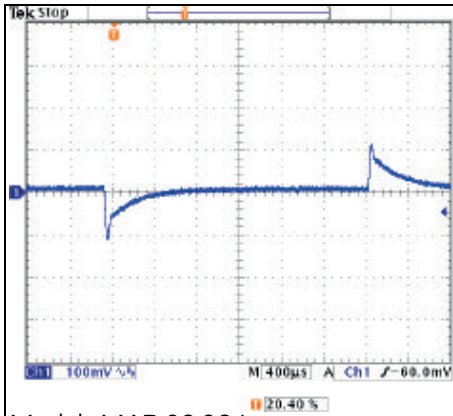
Model : MAB 03 036
Ch1 : +Vout Ch2 : -Vout



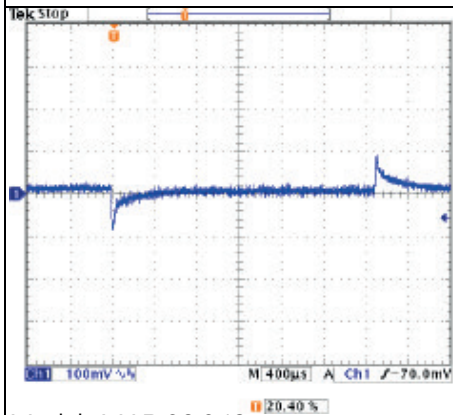
Model : MAB 03 039
Ch1 : +Vout Ch2 : -Vout



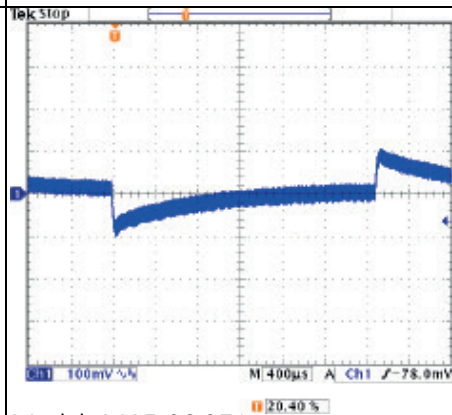
Model : MAB 03 042
Ch1 : +Vout Ch2 : -Vout



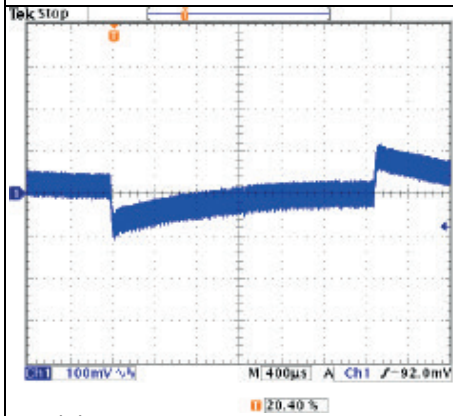
Model : MAB 03 024
Ch1 : Vout



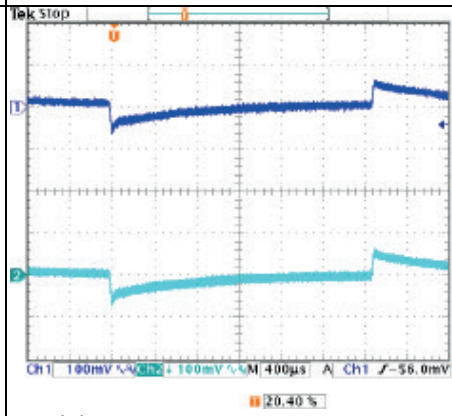
Model : MAB 03 048
Ch1 : Vout



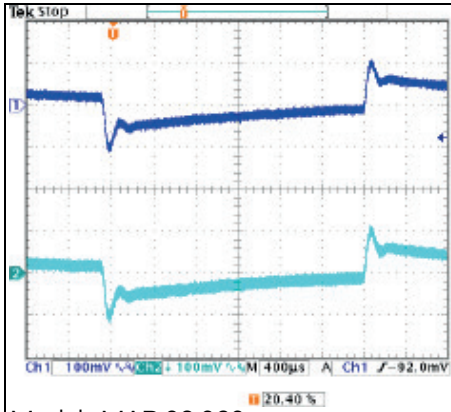
Model : MAB 03 051
Ch1 : Vout



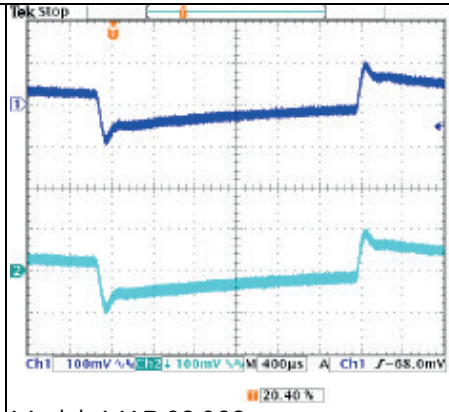
Model : MAB 03 054
Ch1 : Vout



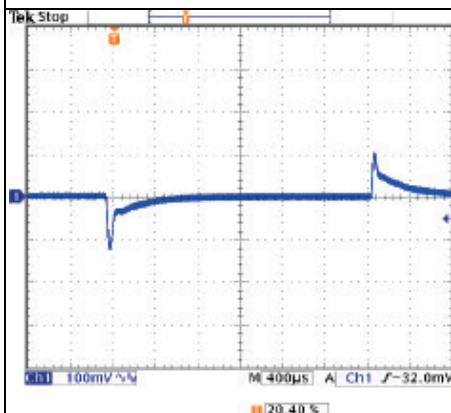
Model : MAB 03 057
Ch1 : +Vout Ch2 : -Vout



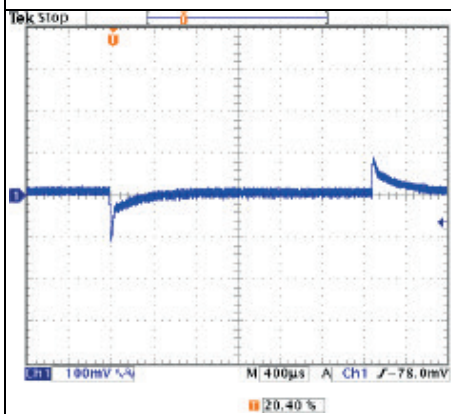
Model : MAB 03 060
Ch1 : +Vout Ch2 : -Vout



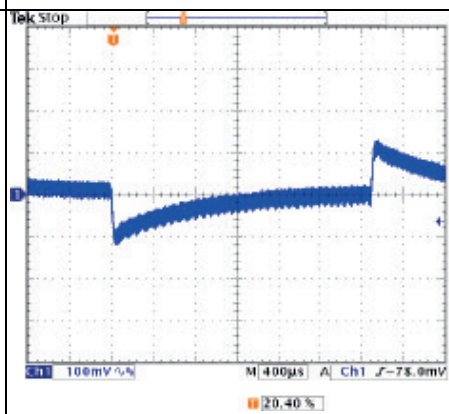
Model : MAB 03 063
Ch1 : +Vout Ch2 : -Vout



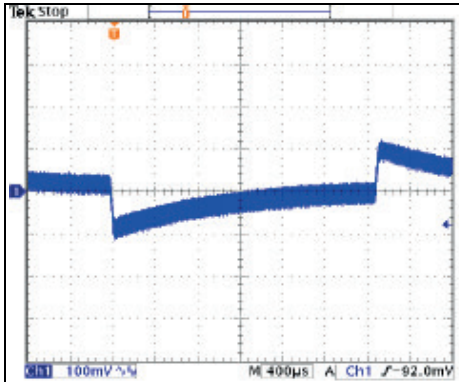
Model : MAB 03 045
Ch1 : Vout



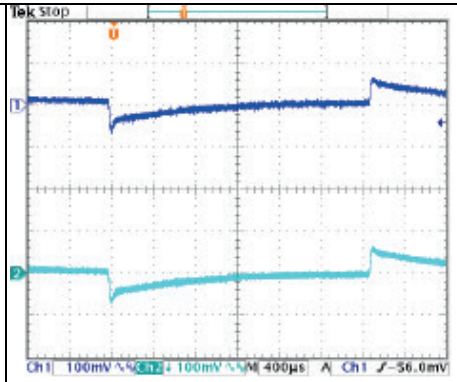
Model : MAB 03 069
Ch1 : Vout



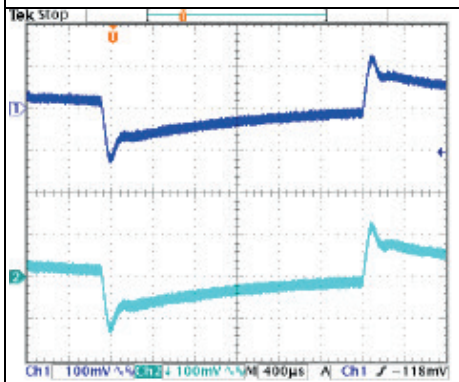
Model : MAB 03 072
Ch1 : Vout



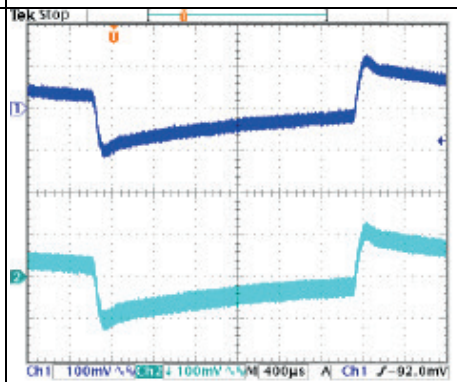
Model : MAB 03 075
Ch1 : Vout



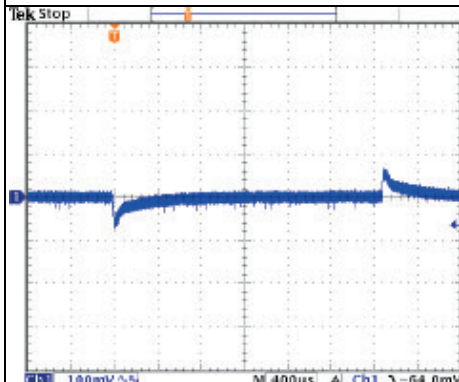
Model : MAB 03 078
Ch1 : +Vout Ch2 : -Vout



Model : MAB 03 081
Ch1 : +Vout Ch2 : -Vout



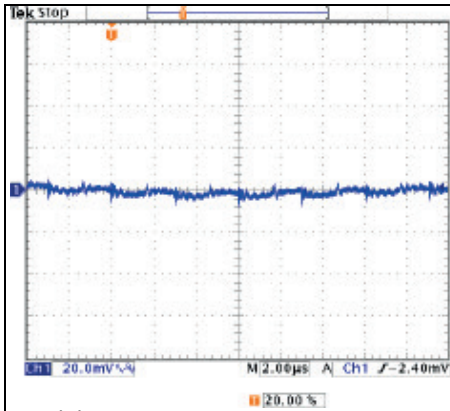
Model : MAB 03 084
Ch1 : +Vout Ch2 : -Vout



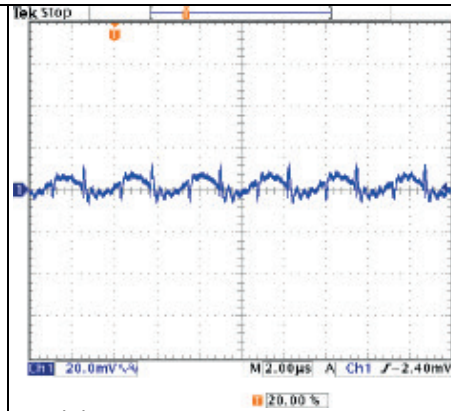
Model : MAB 03 066
Ch1 : Vout

Output Ripple and Noise

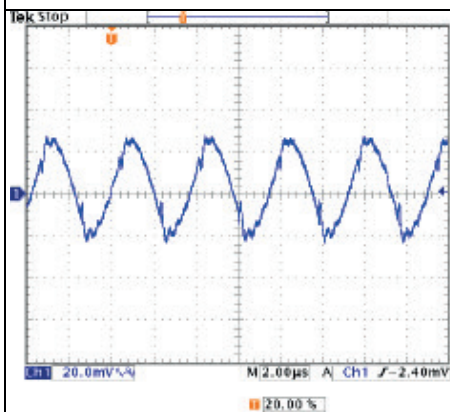
Measuring output ripple waveform peak to peak. Measure mane bandwidth 20 MHz. At nominal input, maximum lout and output with a 0.1uF ceramic capacitor.



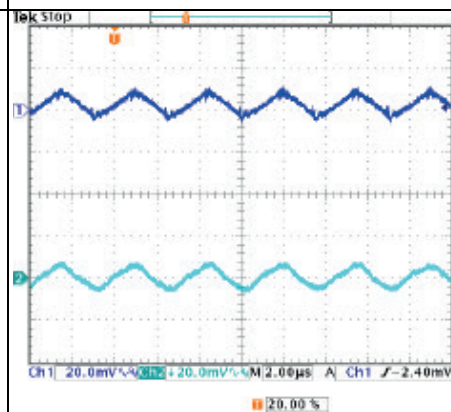
Model : MAB 03 027
Ch1 : Vout
Ripple & noise : 13.2mVp-p



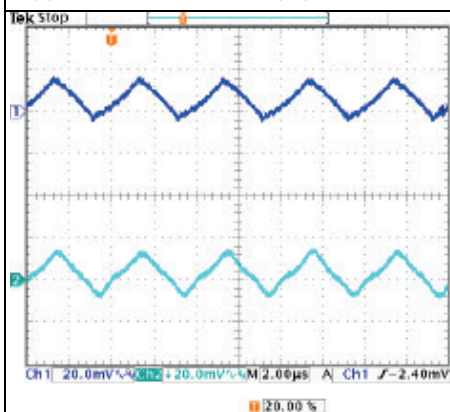
Model : MAB 03 030
Ch1 : Vout
Ripple & noise : 19.6mVp-p



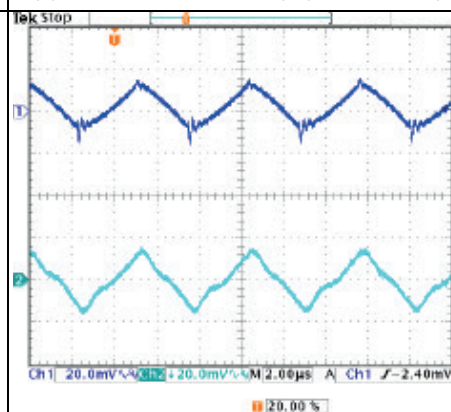
Model : MAB 03 033
Ch1 : Vout
Ripple & noise : 52.0mVp-p



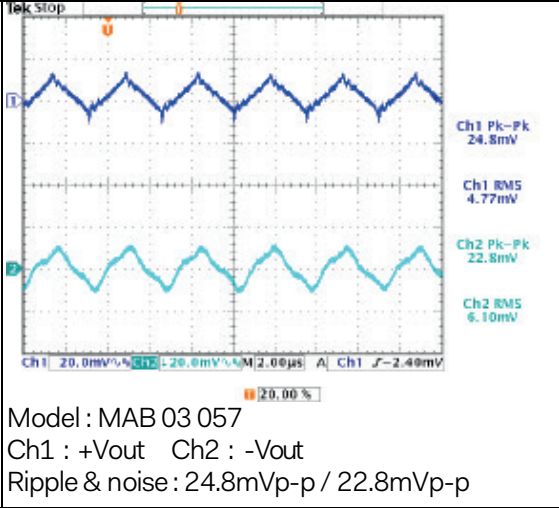
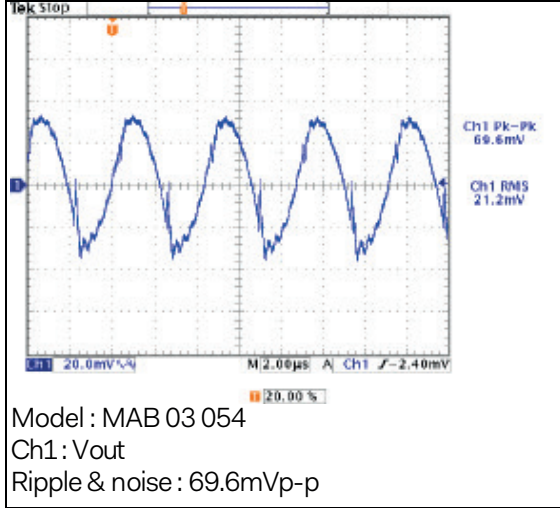
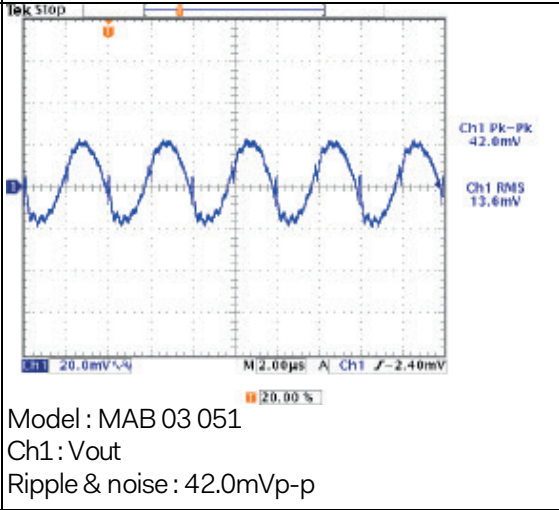
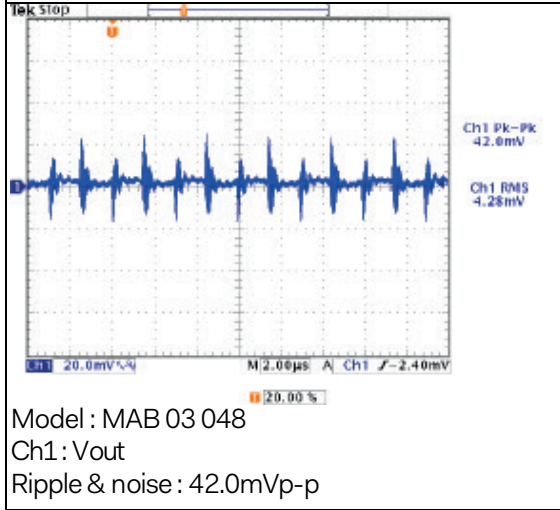
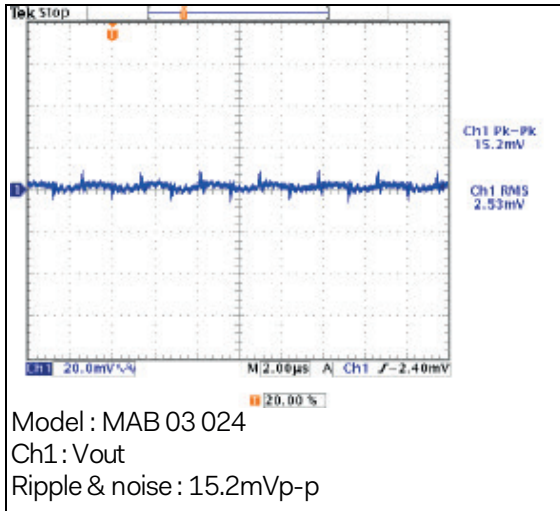
Model : MAB 03 036
Ch1 : +Vout Ch2 : -Vout
Ripple & noise : 16.8mVp-p / 14.8mVp-p

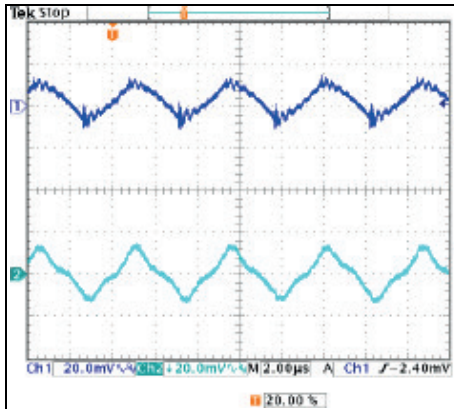


Model : MAB 03 039
Ch1 : +Vout Ch2 : -Vout
Ripple & noise : 22.0mVp-p / 23.6mVp-p

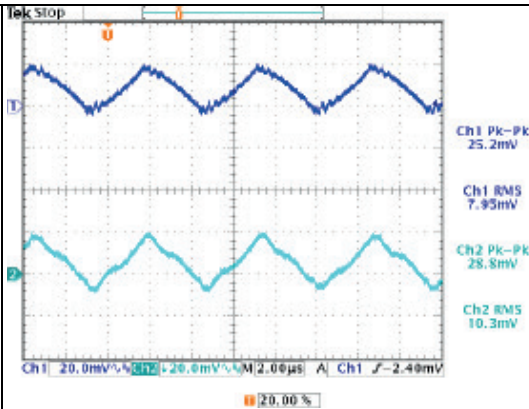


Model : MAB 03 042
Ch1 : +Vout Ch2 : -Vout
Ripple & noise : 31.6mVp-p / 32.0mVp-p

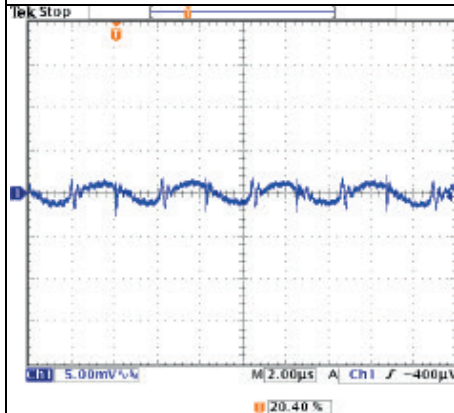




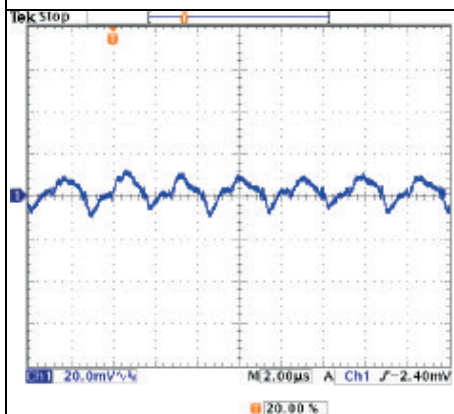
Model : MAB 03 060
Ch1 : +Vout Ch2 : -Vout
Ripple & noise : 26.0mVp-p / 28.4mVp-p



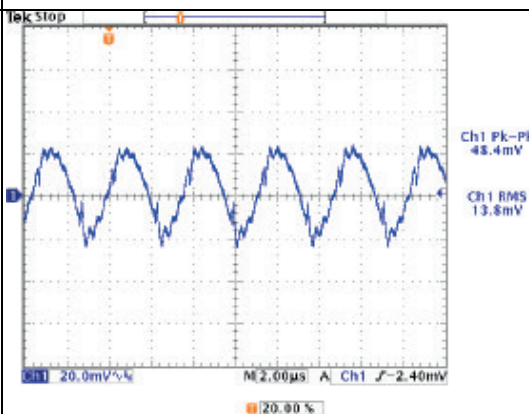
Model : MAB 03 063
Ch1 : +Vout Ch2 : -Vout
Ripple & noise : 25.2mVp-p / 28.8mVp-p



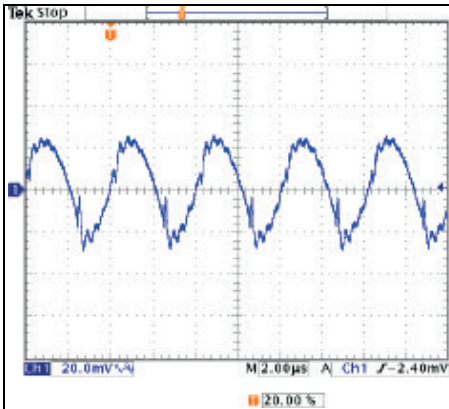
Model : MAB 03 045
Ch1 : Vout
Ripple & noise : 4.80mVp-p



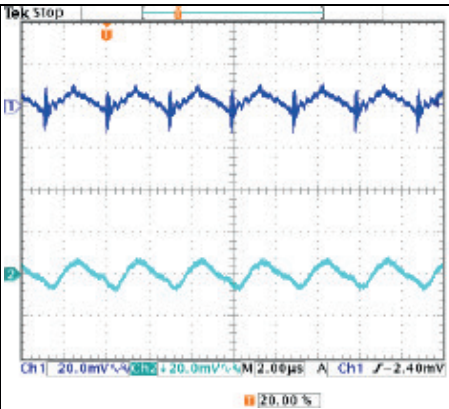
Model : MAB 03 069
Ch1 : Vout
Ripple & noise : 23.2mVp-p



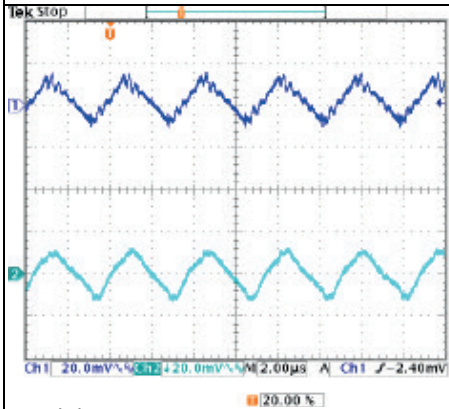
Model : MAB 03 072
Ch1 : Vout
Ripple & noise : 48.4mVp-p



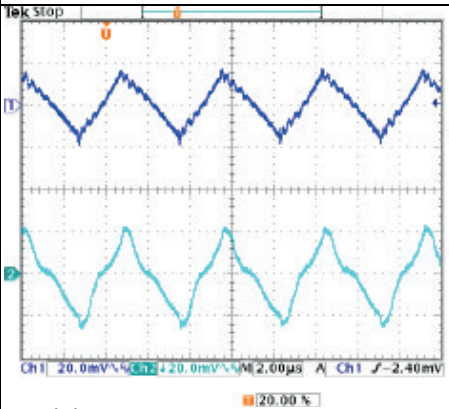
Model : MAB 03 075
Ch1 : Vout
Ripple & noise : 55.2mVp-p



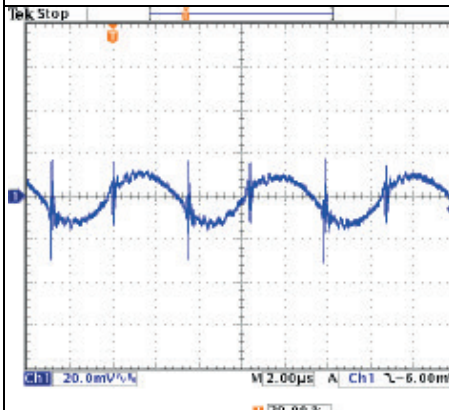
Model : MAB 03 078
Ch1 : +Vout Ch2 : -Vout
Ripple & noise : 24.0mVp-p / 16.8mVp-p



Model : MAB 03 081
Ch1 : +Vout Ch2 : -Vout
Ripple & noise : 26.4mVp-p / 25.6mVp-p



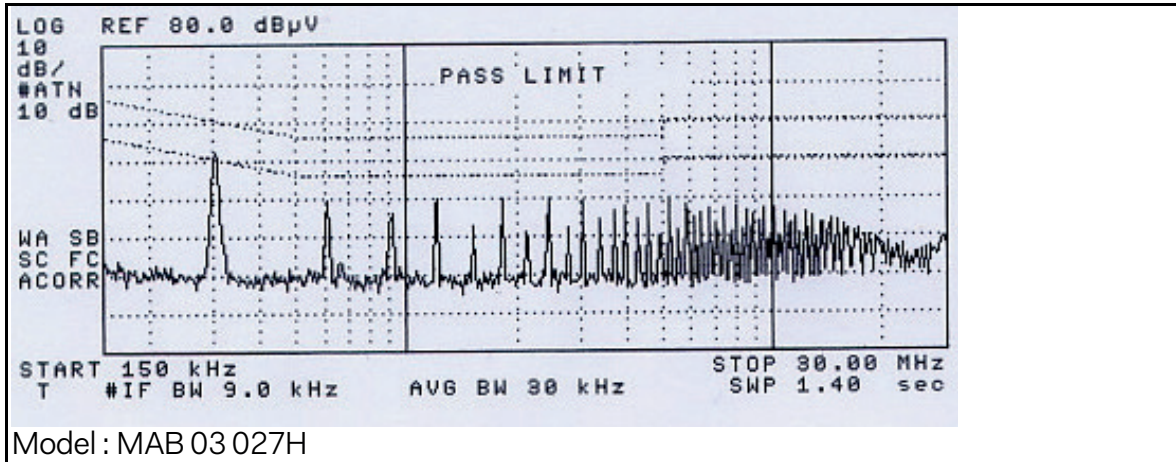
Model : MAB 03 084
Ch1 : +Vout Ch2 : -Vout
Ripple & noise : 36.4mVp-p / 49.6mVp-p



Model : MAB 03 066
Ch1 : Vout
Ripple & noise : 48.4mVp-p

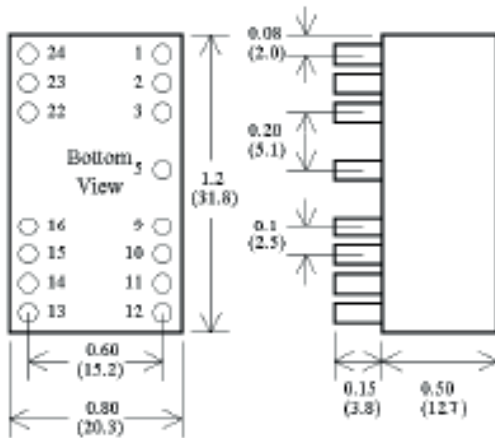
EMI

EN55022 Class B, conducted



Mechanical Specifications

A case mechanical outline diagrams



- Note : 1. Pin size is 0.02"inch(0.5mm)DIA.
2. All dimensions in inches(mm)
3. Tolerance .XX=±.02 , .XXX=±.010

Pin connection

| 500VDC | | | 1.5K and 3.0KVDC | | |
|--------|---------------|-------------|------------------|----------------------|-------------|
| Pin | Single output | Dual output | Pin | Single output | Dual output |
| 1 | +V input | | 1 | NP | |
| 2 | NC | -V output | 2 | -V input | |
| 3 | NC | Common | 3 | -V input | |
| 5 | NP | | 5 | NP / (remote on/off) | |
| 9 | NP | | 9 | NC | Common |
| 10 | -V output | Common | 10 | NC | |
| 11 | +V output | | 11 | NC | -V output |
| 12 | -V input | | 12 | NP | |
| 13 | -V input | | 13 | NP | |
| 14 | +V output | | 14 | +V output | |
| 15 | -V output | Common | 15 | NC | |
| 16 | NP | | 16 | -V output | Common |
| 22 | NC | Common | 22 | +V input | |
| 23 | NC | -V output | 23 | +V input | |
| 24 | +V input | | 24 | NP | |

- Note : 1. NP - No Pin
2 .NC - No Connection with pin