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Application Note

MS1000B-100JA

Inverter Power Supply

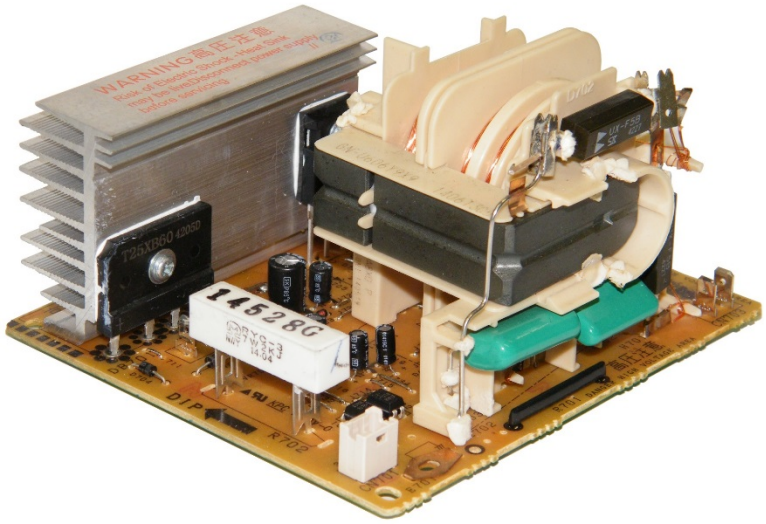
1.0 General Description

The MS1000B-100JA

The MS1000B-100JA is a compact inverter power supply designed for industrial microwave ovens and special industrial heating applications. The MS1000B-100JA provides very good performance with stable operation and fast response times throughout the allowable power bandwidth. Innovative features enable the design of compact and cost effective solutions while reducing overall design cycle time and system cost. The MS1000B-100JA also enables the design of power supplies with robust functionality and provides enhanced safety features such as short circuit and open circuit protection.

2.0 Scope

This application note is intended for engineers designing for industrial microwave ovens using the MS1000B-100JA power supply. It provides a guideline to enable an engineer to quickly understand the operating specifications and interface requirements. For more detailed information about the use of the devices itself, please refer to the corresponding product manual or datasheet.



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3.0 Product Specification

Ratings:

Type	Measure	Notes
Mains voltage	120 V AC	6
Mains frequency	60 Hz	
Max. Input Current	16.5 A	1
Variable PWM Duty	20% - 90%	1, 2
Minimum Operating Temperature	-5°C	1, 3
Tolerance Input Current	16.0 (+/-) 0.4A	4, 5

Notes

1. It is based on condition that all items specified in this specifications sheet are complied with especially certain cautions for temperature specifications.
2. The allowable maximum PWM is 85% in motive1 period, and it is less than 90% in Run mode.
3. Minimum Operating Temperature means the minimum ambient operation temperature of a microwave oven with this Inverter, and on the other hand, about the maximum operating temperature it follows the temperature standard of each components.
4. This shows the input current and its tolerance at the condition that PWM is 85% and the period of PWM is 220Hz using the specified magnetrons (2M236 & 2M261). Whose Emb is typical.
5. When you decide the percentage of PWM with your model, the standard Inverter submitted shall be used.
6. This Input voltage is defined the voltage when Inverter is operating. And the High Voltage wire which is connected between Inverter and Magnetron shall be AWG18 and its length shall be less than 320mm. The Inverter operates safely and without any problems when the range of the power source is between 102V to 138V.

4.0 Hardware Connections

4.1. Main AC Input

Signal Description: The AC mains input voltage.

- **Signal Input:** 120VAC 60Hz @ 16.5 Amperes, maximum
- **Connector Description:** The main AC power input is 4mm Faston type connector. The reference designator for this connector is CN702.

4.2 Main Safety Ground Input

Signal Description: Main Safety ground.

- **Connector Description:** Through hole - 3mm. The reference designator for this connector is E701.

4.3 Control Signal Input

Signal Description: PWM control signal input.

- **Signal Input:** 220Hz (TTL)
- **Connector Description:** 3-Pin Male. (Recommended connector type is 3-Pine Female with 2.54mm pitch; AMP-926475-3).The reference designator for this connector is CN701.

PWM Connector Wiring

Signal Name/Description	Pin Number	Type
Pin	1	Output
Common Ground	2	Input/Output
Pout	3	Input

4.4 HV Output

Signal Description: HV output and filament supply voltage for the magnetron.

- **Signal Output:** -4500V @ 300mA max. The required 3.3V/10A (nominal) filament power is provided on the on the HV signal.
- **Connector Description:** The HV power inputs are 4mm Faston type connectors. The reference designator for this connector is CN703.

5.0 Power Supply Control and Operation

5.1 Output Power Control Input

- **Signal Description:** 220Hz (TTL) signal. The allowable duty cycle is 20% to 90%.

Pout : output terminal ; PWM Signal

Pin : input terminal ; OSC Signal

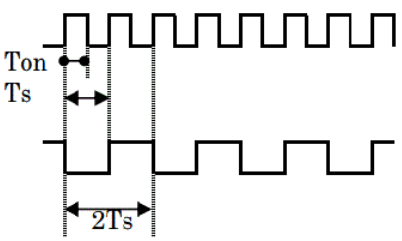
(1) The duty of PWM $\left(\frac{T_{ON}}{T_s}\right)$

$$0.20 \leqq \left(\frac{T_{ON}}{T_s}\right) \leqq 0.90$$

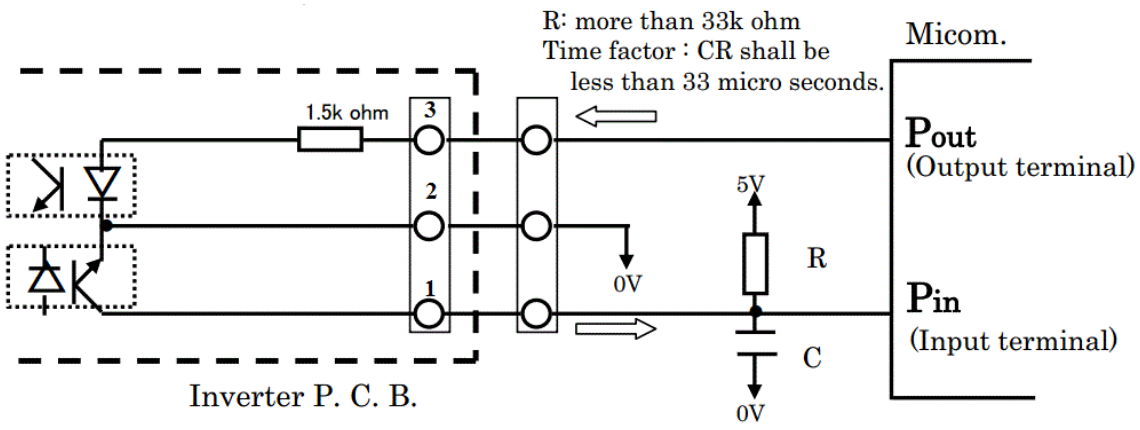
(2) The time of Ts

4 msec ≦ Ts ≦14.3 msec

$$f_{PWM} = \frac{1}{T_s}$$



5.1.1 Interface Circuit Diagram Example



5.2 Fault Indication Signal

- **Signal Description:** 110Hz (TTL) signal.
- **Signal Type:** Output – PS OK is Low or Pulse
  Output – PS Fail or Off is High

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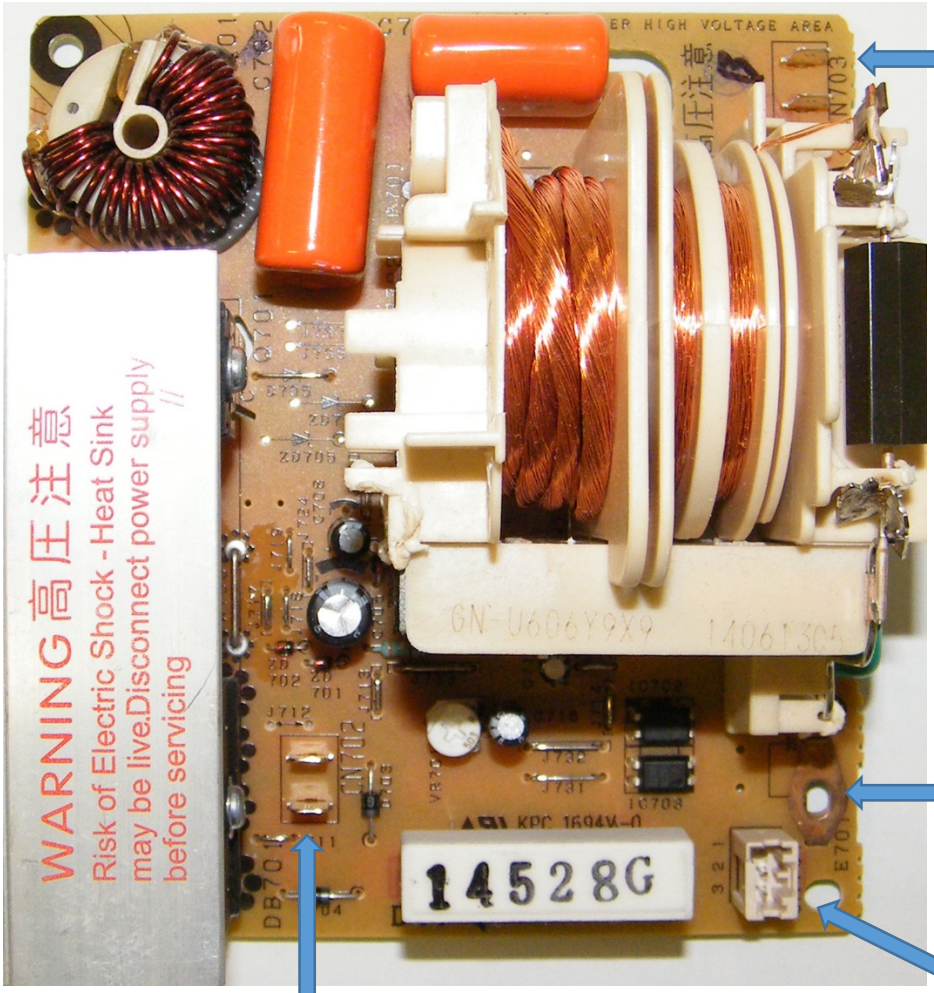
Appendix

Connection Location



Connection CN703
HV Output

Connection E701
Main Safety Ground

Connection CN701
Control Signal Input

Connection CN702
Main AC Input

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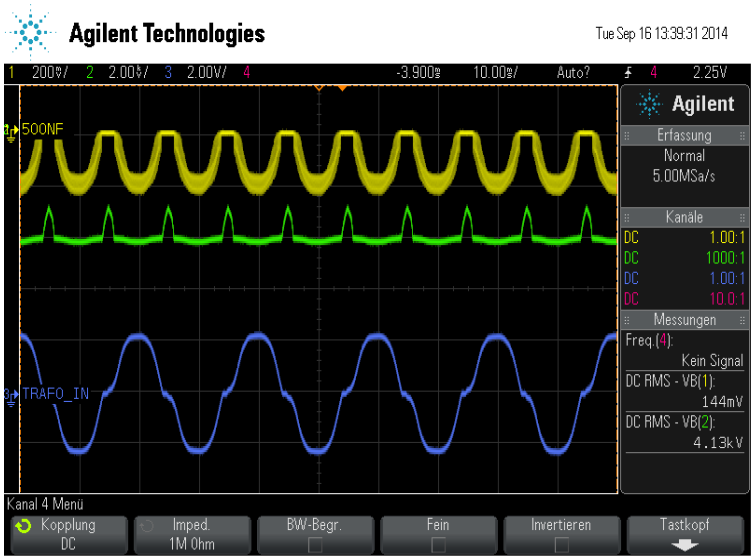
Output Power Table						
	2M236			2M261		
Set Value DC %	Mains Power (W)	MW Power (W)	Eff. (%)	Mains Power (W)	MW Power (W)	Eff. (%)
20	505	290	57.4	500	280	50.0
30	720	430	59.7	750	450	60.0
40	925	555	60.0	950	550	57.9
50	1120	690	61.6	1115	680	61.0
60	1290	800	62.0	1280	785	61.3
70	1480	950	64.2	1470	900	61.2
80	1650	1000	60.6	1650	1000	60.6
90	1800	1100	61.1	1790	1100	61.5

Measurement Signals

High Voltage, Mains Current & Microwave Power



Y = MW / G = HV / B = Mains Current

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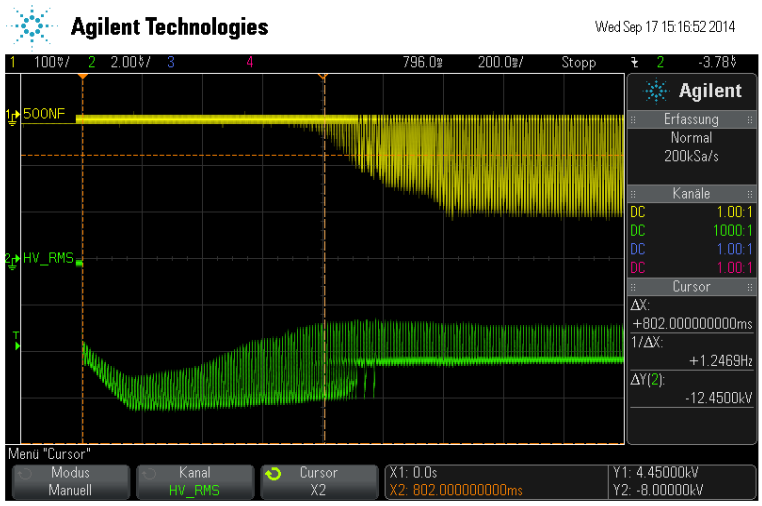
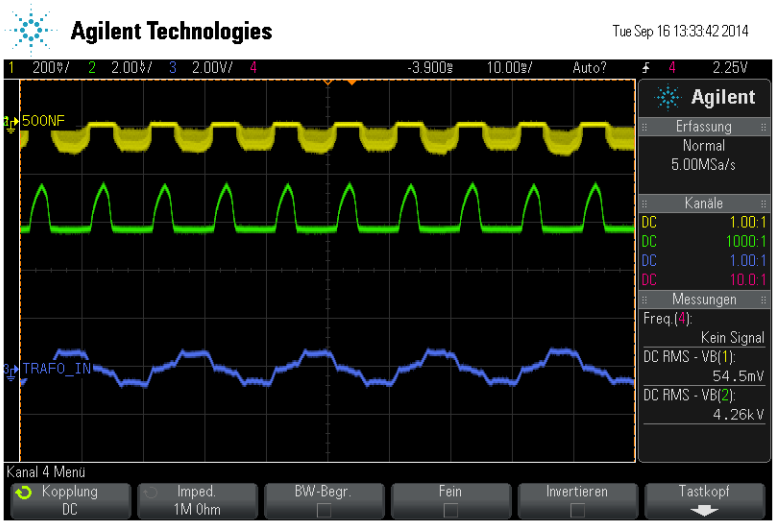
High Voltage and Microwave Output Timing Chart



Y = MW / G = HV

Output Signals at Different Set-Points



Turn on MW @ 20% DC, cold Magnetron
Y MW / G HV / B Mains Current

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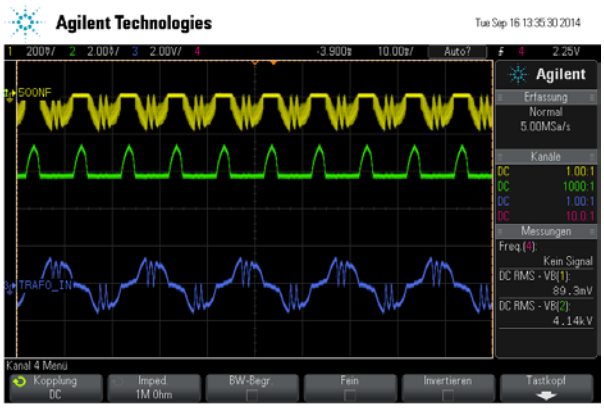
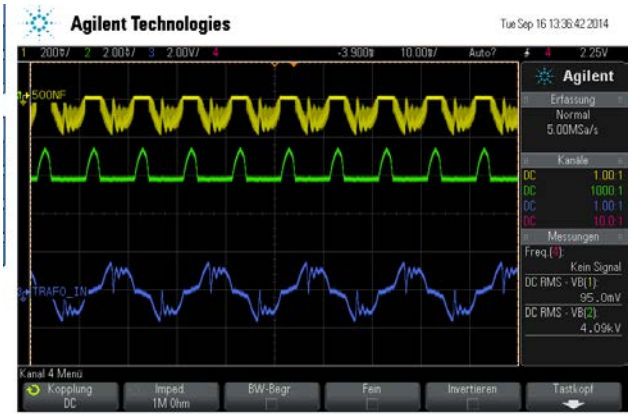
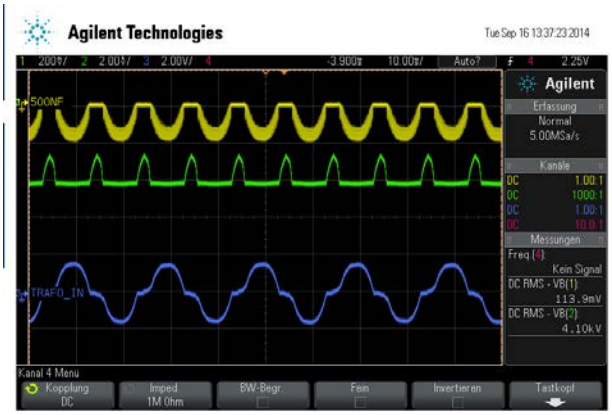


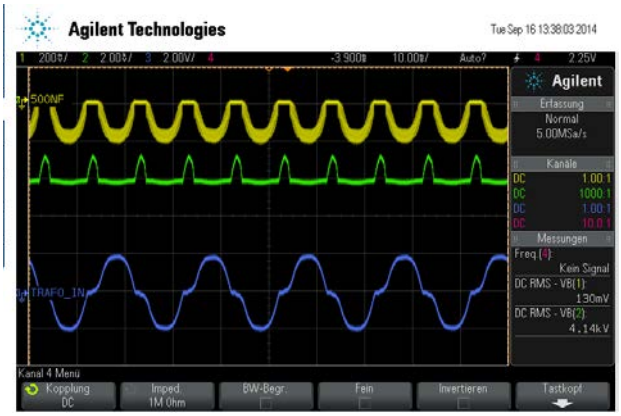
Increased power from 20% DC to 35% DC
Y MW / G HV / B Mains Current



Increased power from 35% DC to 45% DC
Y MW / G HV / B Mains Current



Increased power from 45% DC to 50% DC
Y MW / G HV / B Mains Current



Increased power from 50% DC to 65% DC
Y MW / G HV / B Mains Current

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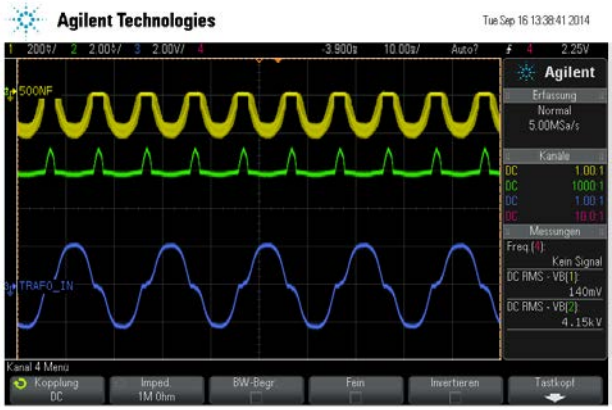
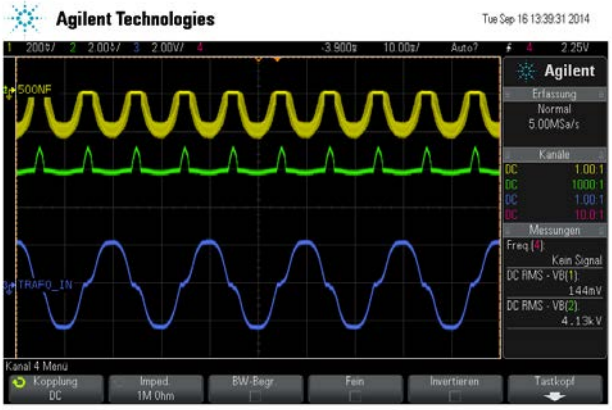


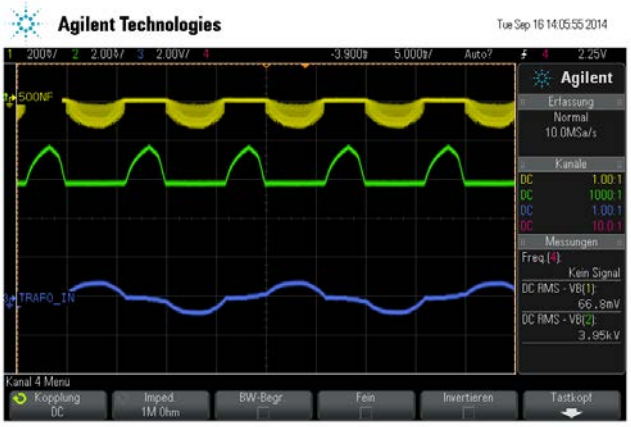
Increased power from 45% DC to 50% DC

Y MW / G HV / B Mains Current



Increased power from 50% DC to 65% DC

Y MW / G HV / B Mains Current



Start with 50% DC and reduce to 20% DC

Y MW / G HV / B Mains Current

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