



Universal AC 15 W 4 Cell Charger

Device	Application	Input Voltage	Output Power	Topology	I/O Isolation
MBT3906 MC33340 NCP1055 NIS6111	4 Cell NiCd-NiMH Battery Charger	Universal 90-264 Vac	15 Watt	Flyback	Optional

Other Specifications				
	Output 1	Output 2	Output 3	Output 4
Output Voltage	5.9 Vdc max	N/A	N/A	N/A
Ripple	125 mA	N/A	N/A	N/A
Nominal Current	2.5 A	N/A	N/A	N/A
Max Current	3.0 A	N/A	N/A	N/A
Min Current	N/A	N/A	N/A	N/A

PFC (Yes/No)	NO
Minimum Efficiency	80%
Inrush Limiting / Fuse	750 mA fuse
Operating Temp. Range	0 to +40° C
Cooling Method/Supply Orientation	Case Convection

Circuit Description

This four-cell nickel battery rapid charger is based on the very low cost gated oscillator PWM switcher. The MC33340 -dV/dt detector controls the charging profile. The rapid charge rate current level is set to the maximum by magnetic and the NCP1055 design.

One problem common to all rapid chargers is the dynamic range from trickle charge to rapid rates. The 2.5 A rapid charge is about 100 times the 25 mA trickle.

This design overcomes this by utilizing a timer with an approximate 1% duty cycle to achieve the time averaged 25 mA trickle charge. ON's co-packaged discrete transistors perform the analog functions with very low cost and reasonable temperature stability.

The CCM-DCM boundary is at 142 Vac. European operation will be in DCM while the US will be in CCM. The charger is shown with the optional optocoupler in blue for isolated circuits. For the lowest cost chargers with integrated case isolation barrier systems the optocoupler can be eliminated. Then tie the two DC returns together and U7-2 is connected to U7-4.

The schematic shows optional Y caps in pink for systems with a three-wire power cord. The earth return provides additional margin for applications that require more EMI filtering or earth ground connection.

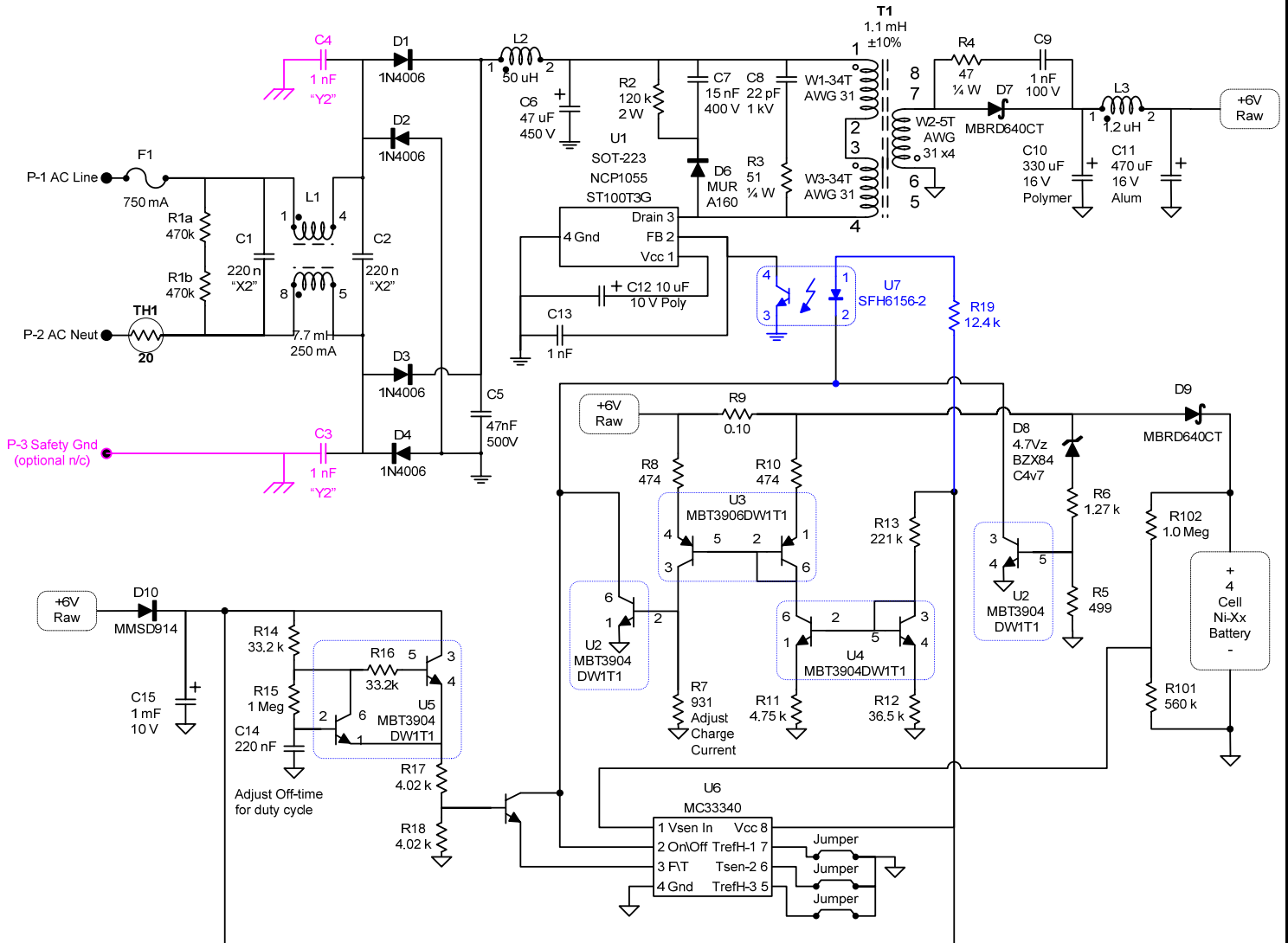
Blocking diode D9 prevents reverse current from the battery flowing through the low power bias circuitry when the charger is powered off. Efficiency can be improved by eliminating the diode. The NIS6111 BERS rectifier can be used for D7 and D9 to improve efficiency about 7% but at slightly higher cost.

Key Features

- 2.5 Ampere fast charger.
- Vdc limited open circuit output.
- 100 kHz Switchmode gated oscillator.
- Frequency dithering reduces EMI signature.
- Rapid charge rate current dynamically limited.
- Trickle charge rate is timer duty cycle controlled.
- Very low standby power consumption.

DN06023/D

Schematic

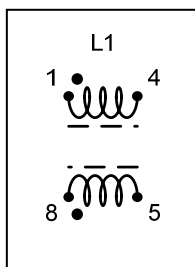


Magnetics Design Data sheet

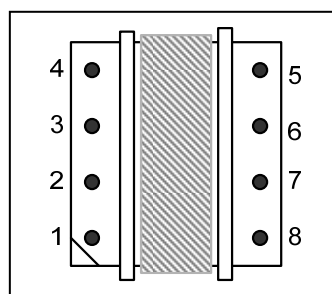
Magnetics Design Data sheet				
Project / Customer	4 Cell Charger For Ni-Cd, Ni-MH			
Description:	Differential Mode Inductor			
Schematic Ref. Des:	L1			
Bobbin:	Vertical 8-Pin			
Core:	EE-42211 J	Magnetics Inc.		
Core Gap:	none			
Inductance Magnetizing:	7.7 mH	±5%	100 kHz	Pin 1-4, 5-8
Inductance Leakage:	110 uH	±5%	100 kHz	Pin 1-4, 5-8 shorted.

Windings (in order) Layer	Winding	Turns	Size	No of Wires	Material
W1		47			
1	W1	8	23 awg	1	Isonol180
2	W1	8	23 awg	1	Isonol180
3	W1	8	23 awg	1	Isonol180
4	W1	8	23 awg	1	Isonol180
5	W1	8	23 awg	1	Isonol180
6	W1	7	23 awg	1	Isonol180
W2		47			
1	W2	8	23 awg	1	Isonol180
2	W2	8	23 awg	1	Isonol180
3	W2	8	23 awg	1	Isonol180
4	W2	8	23 awg	1	Isonol180
5	W2	8	23 awg	1	Isonol180
6	W2	7	23 awg	1	Isonol180
HiPot:					
P-S		4 kVac	1 s.		

Schematic



Lead Pin-out



Magnetics Design Data sheet

Magnetics Design Data sheet				
Project / Customer	4 Cell Charger For Ni-Cd, Ni-MH			
Description:	Common Mode Inductor			
Schematic Ref. Des:	L2			
Bobbin:	none			
Core:	T 2/1.3/0.6		General Purpose	
Core Gap:	none			
Inductance Magnetizing:	51 uH	±5%	100 kHz	Pin 1-2
Inductance Leakage:	NA	±5%	100 kHz	-.

Windings (in order) Layer	Winding	Turns	Size	No of Wires	Material
W1		34			
1	W1	34	34 awg	5	Isonol180

Magnetics Design Data sheet

Magnetics Design Data sheet				
Project / Customer	4 Cell Charger For Ni-Cd, Ni-MH			
Description:	Output filter Inductor			
Schematic Ref. Des:	L3			
Bobbin:	none			
Core:	T 1.2/0.83/0.5	General Purpose		
Core Gap:	none			
Inductance Magnetizing:	1.24 uH	±5%	100 kHz	Pin 1-2
Inductance Leakage:	NA	±5%	100 kHz	-.

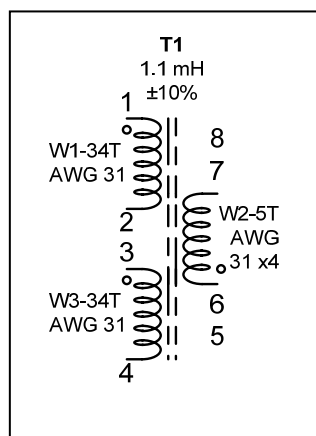
Windings (in order) Layer	Winding	Turns	Size	No of Wires	Material
W1		6			
1	W1	6	22 awg	5	Isonol180

Magnetics Design Data sheet

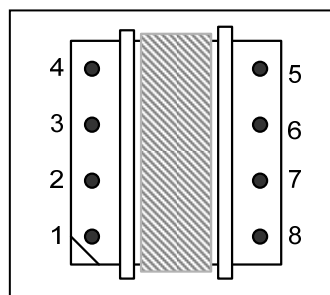
Project / Customer	4 Cell Charger For Ni-Cd, Ni-MH			
Description:	Transformer			
Schematic Ref Des:	T1			
Bobbin:	Vertical 8-Pin			
Core:	EE-43007 P	Magnetics Inc.		
Core Gap:	TBD			
Inductance Magnetizing:	1.1 mH	±5%	100 kHz	Pin 1-4 with 2-3 shorted.
Inductance Leakage:	7 uH	±5%	100 kHz	Pin 1-4, 2-3, 5-6-7-8 shorted.

Windings (in order) Layer	Winding	Turns	Size	No of Wires	Material
W1		34			
1	W1	17	23 awg	1	Isonol180
2	W1	17	23 awg	1	Isonol180
3	Tape	3	0.05		PVC
W2		5			
4	W2	5	23 awg	4	Isonol180
5	Tape	3	0.05		PVC
W3		34			
6	W3	17	23 awg	1	Isonol180
7	W3	17	23 awg	1	Isonol180
8	Tape	1	0.05		PVC
HiPot:					
P-S		4 kVac	1 s.		
P-Core		4 kVac	1 s.		
S-Core		4 kVac	1 s.		

Schematic



Lead Pin-out



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