OZ813

Ultra High Efficiency Dual DC-DC Controller

FEATURES

- Dual DC-DC SMPS controller with integrated drivers
- Two constant ripple-current controllers
- Constant ripple-current control allows optimum inductor size
- High full load efficiency; up to 94%
- High light load efficiency; >85% at 100mA
- Vout accuracy; 1% or better
- Input voltage; from 3V to 26V
- Output voltage – adj. from 0.5V to 2.75V
- Output current - up to 15A
- Independent
  - Power Good signals
  - ON/SKIP signals
- Soft-Start at start-up
- Soft-stop at shutdown
- Voltage Feed-Forward Compensation
- User adjustable operating frequency
- Dynamic voltage change support
- Output Protection:
  - Latched Over Voltage Protection
  - Latched Under Voltage Protection
  - Valley type Over Current Protection
- Input Protection:
  - Under Voltage Lock Out on VDDA
  - Under Voltage Lock Out on VIN

APPLICATIONS

Power Supplies for Notebook CPU and Peripherals

ORDERING INFORMATION

Part Number	Temp Range	Package
OZ813LN	0°C to 85°C	QFN24 Lead-Free

GENERAL DESCRIPTION

OZ813 is a DC/DC controller specially developed to design power supplies for next generation microprocessors, their peripherals and chipsets. OZ813 steps down the high battery voltage to low output voltages in the range of 0.5V to 2.75V. High efficiency, DC accuracy and excellent transient response make OZ813 suitable for supplying low voltage CPU peripherals, chipset cores, and graphics processors. OZ813 has two independent constant ripple-current buck controllers with powerful integrated drivers able to drive output currents up to 15A.

Voltage Feed-Forward compensation assures high rejection of input voltage transients typically occurring when the AC adapter is plugged in or removed.

Over Voltage Protection (OVP) acts when the output voltage exceeds the set voltage by more than 125mV. This protection condition is latched and initiates a ramp down of the output voltage.

Under Voltage Protection (UVP) acts when the output voltage falls below the set voltage by more than 133mV. This protection condition is latched and initiates a ramp down of the output voltage.

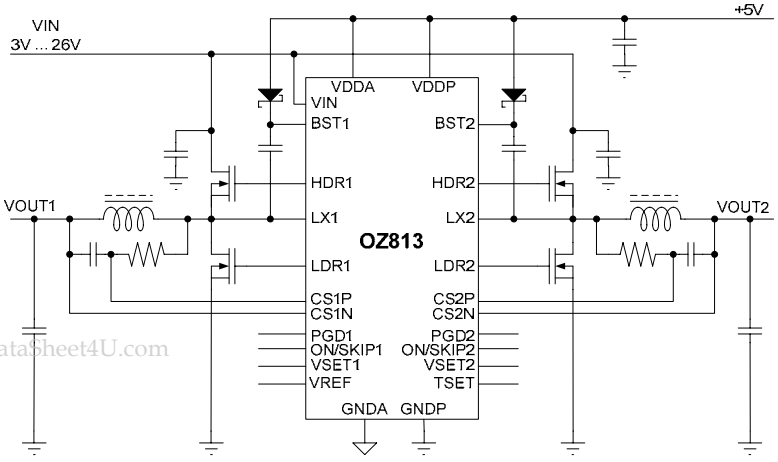
After an OVP or UVP event, the ON/SKIP pin should be toggled or VDDA/VIN cycled to restart the circuit.

Both outputs are protected against overload by individual, valley current type, cycle-by-cycle (Over Current Protection) OCP circuits.

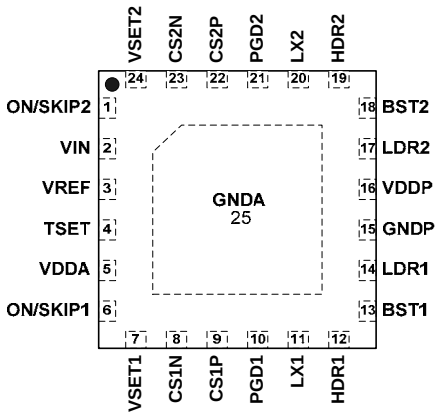
The Under Voltage Lock Out circuit monitors both, VDDA and VIN and lets the controller operate only if VDDA > 4.3V and VIN > 2.5V.

The Power Good signal is high as long as the output voltage is within +125mV/-133mV of the set voltage. At startup the output voltage ramps up in a controlled manner with a typical slew rate of 1V/ms and at shutdown the output voltage is ramped down in a controlled manner with the same slew rate.

SIMPLIFIED APPLICATION DIAGRAM



PIN DIAGRAM



PIN DESCRIPTION

No.	Name	I/O	Type	Description
1	ON/SKIP2	I	Digital	Enables Channel 2 operation. If $V_{ON/SKIP2}$ > 0.6V, the Vout2 voltage ramps up to the voltage set on VSET2 pin with a slew rate of 1V/ms. If $V_{ON/SKIP2}$ > 2.1V the controller enters skip mode of operation. If both ON/SKIP1 and ON/SKIP2 pins are < 0.4V the chip is disabled and enters a very low consumption mode < 1µA. To re-enable the controller the voltage on at least one of the ON/SKIP pins need to exceed 1V. Once the chip is enabled the conditions above applies.
2	VIN	I	Analog	Input voltage sense. Used for feed-forward compensation. Also monitored by the Under Voltage Lock Out circuit. Let the controller operate only if Vin > 2.5V. Must be connected to the input voltage of the power stage.
3	VREF	O	Analog	2.75V +/- 1% precision reference voltage. A 0.1µF should be placed from VREF to GNDA.
4	TSET	P	Power	Adjust the Ton of the controller according to the formula: Ton = (1.6µs*V_{TSET})/(Vin-Vout) A 0.1µF capacitor must be placed from TSET to GNDA.
5	VDDA	P	Power	+5V supply for the controller analog circuits. A 1µF capacitor should be placed from VDDA to GNDA.
6	ON/SKIP1	I	Digital	Enables Channel 1 operation. If $V_{ON/SKIP1}$ > 0.6V, the Vout1 voltage ramps up to the voltage set on VSET1 pin with a slew rate of 1V/ms. If $V_{ON/SKIP1}$ > 2.1V the controller enters skip mode of operation. If both ON/SKIP1 and ON/SKIP2 pins are < 0.4V the chip is disabled and enters a very low consumption mode < 1µA. To re-enable the controller the voltage on at least one of the ON/SKIP pins need to exceed 1V. Once the chip is enabled the conditions above applies.
7	VSET1	I	Analog	Sets the Vout1 output voltage of the first controller. Uses a resistor divider from the reference voltage.
8	CS1N	I	Analog	Inverting current sense pin for channel 1.
9	CS1P	I	Analog	Non-inverting current sense pin for channel 1.
10	PGD1	O	Digital	Power Good output for Vout1. It is an open drain output asserted high when the output voltage Vout1 is within +125mV/-133mV of the set value.
11	LX1	P	Power	Inductor switching node for channel 1.
12	HDR1	O	Digital	Output of the high side driver for channel 1.
13	BST1	P	Power	Positive supply for the high side driver of channel 1. A 0.1µF capacitor should be placed between BST1 and LX1.
14	LDR1	O	Digital	Output of the low side driver for channel 1.
15	GNDP	P	Power	Power Ground.
16	VDDP	P	Power	Positive supply for the low side driver. A 1µF capacitor should be placed from VDDP to GNDP.
17	LDR2	O	Digital	Output of the low side driver for channel 2.
18	BST2	P	Power	Positive supply for the high side driver of channel 2. A 0.1µF capacitor should be placed between BST2 and LX2.
19	HDR2	O	Digital	Output of the high side driver for channel 2.
20	LX2	P	Power	Inductor switching node for channel 2.
21	PGD2	O	Digital	Power Good output for Channel2. It is an open drain output asserted high when output voltage Vout2 is within +125mV/-133mV of the set value.
22	CS2P	I	Analog	Non-inverting current sense pin for channel 2.
23	CS2N	I	Analog	Inverting current sense pin for channel 2.
24	VSET2	I	Analog	Sets the Vout2 output voltage of the second controller. Uses a resistor divider from the reference voltage.
25	GNDA	P	Power	Ground for the controller analog circuits.

TYPICAL APPLICATION SCHEMATIC

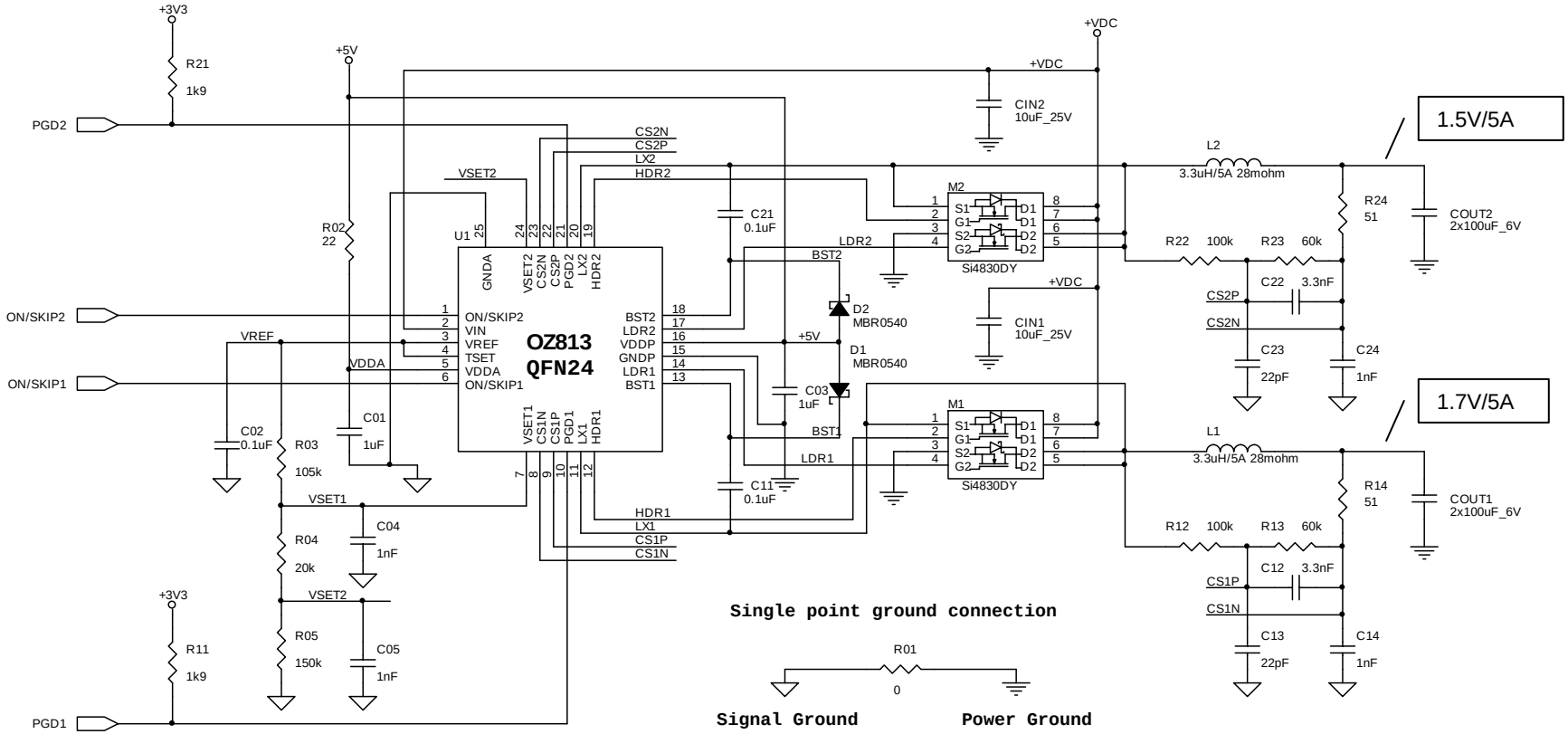


Figure 16. Typical Chipset Power Supply Schematic

BILL OF MATERIALS

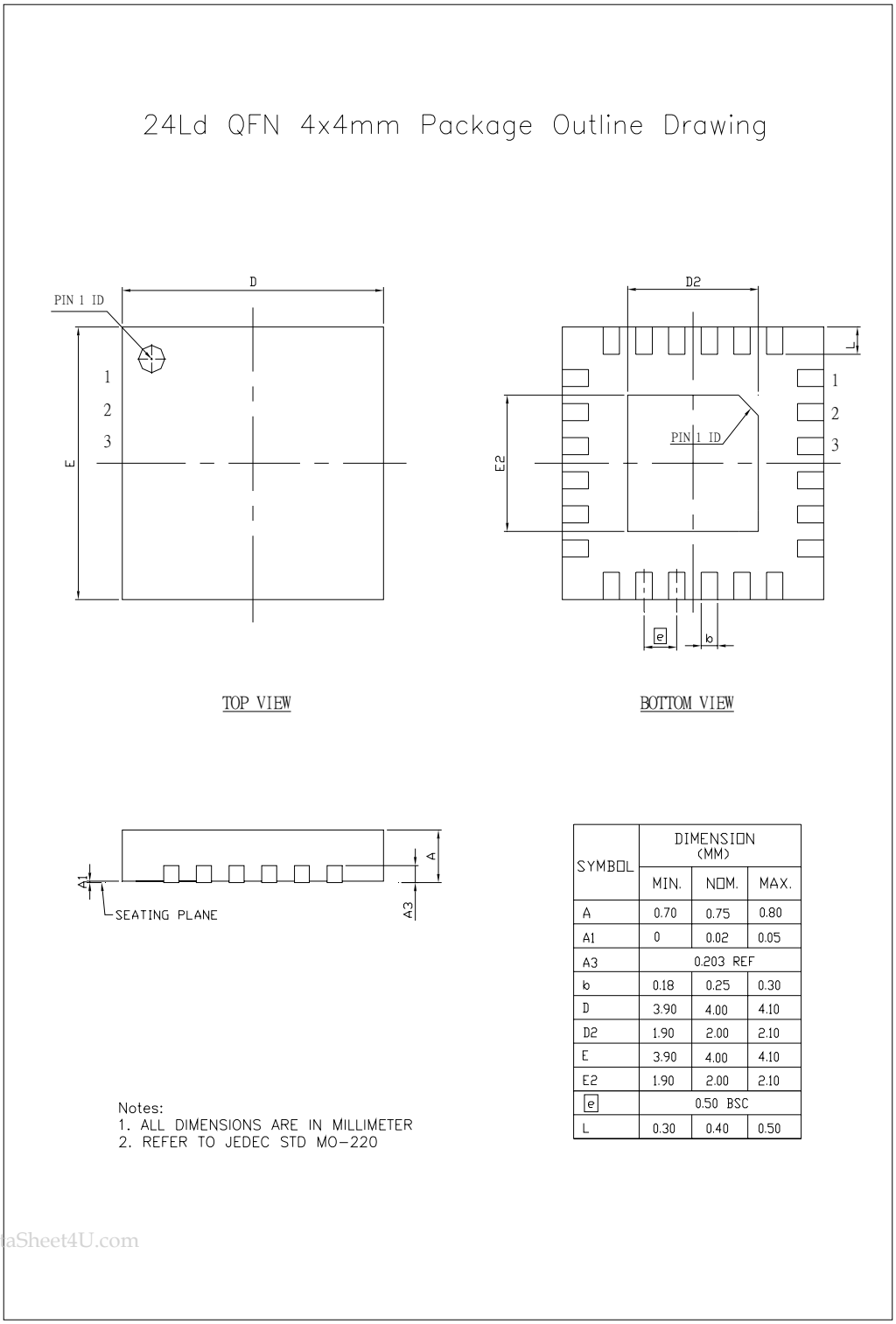
Item	Qty	Reference	Value	Vendor	Part Number	PCB Footprint
1	2	CIN1, CIN2	10u/25V	Taiyo-Yuden	TMK325BJ106MM-B	1210
				Johanson Dielectrics	250S41X106M	
				TDK	C3225X7R1E106M	
2	2	COUT1, COUT2	2x100uF/6V	Taiyo-Yuden	JMK325BJ107MY-T	1210
				Johanson Dielectrics	6R3S41X107M	
				TDK	C3225X5R0J107M	
3	3	C02, C11, C21	0.1uF/10V	Any	Ceramic – X7R or X5R	0603
4	2	C01, C03	1uF/10V	Taiyo-Yuden	EMK107BJ105KA-B	0603
				Johanson Dielectrics	100R14X105M	
				TDK	C1608X5R1A105K	
5	2	C12, C22	3.3nF/25V	Any	Ceramic – X7R or X5R	0603
6	4	C04, C05, C14, C24	1nF/6V	Any	Ceramic – X7R or X5R	0603
7	2	C13, C23	22pF	Any	Ceramic	0603
8	1	R01	0	Any		0603
9	1	R02	22	Any		0603
10	1	R03	105k 1%	Any		0603
11	1	R04	20k 1%	Any		0603
12	1	R05	150k 1%	Any		0603
13	2	R11, R21	1k9	Any		0603
14	2	R12, R22	100k 1%	Any		0603
15	2	R13, R23	60k 1%	Any		0603
16	2	R14, R24	51	Any		0603
17	2	D1, D2	NONE	Vishay	MBR0540	SOD-123
18	2	M1, M2	NONE	Vishay	Si4830DY	SO-8
				Fairchild	FDS6982S	
19	2	L1, L2	3.3u/5A	Vishay	IHLP2525CZ-01	2525
				TOKO	FDV0630 3R3	
20	1	U1	OZ813	O_2Micro, Inc.	OZ813	QFN24

COMPONENT SUPPLIERS

Manufacturer	Contact Information	
	Phone	Website
Power MOSFETs		
Vishay	1-402-563-6866	www.vishay.com
Fairchild	1-703-478-5800	www.fairchildsemi.com
Inductors		
Vishay	1-402-563-6866	www.vishay.com
TOKO	1-408-432-8281	www.toko.com
Diode		
Vishay	1-402-563-6866	www.vishay.com
Fairchild	1-703-478-5800	www.fairchildsemi.com
Capacitors		
Taiyo-Yuden		www.t-yuden.com
Johanson Dielectrics	1-818-364-9800	www.johansondielectrics.com
TDK	1-800-344-2112	www.tdk.com
Resistors		
Vishay	1-402-563-6866	www.vishay.com
TDK	1-800-344-2112	www.tdk.com

PACKAGE INFORMATION

Exposed pad at bottom is GNDA (pin 25) and must be fully soldered to PCB



SYMBOL	DIMENSION (MM)		
	MIN.	NOM.	MAX.
A	0.70	0.75	0.80
A1	0	0.02	0.05
A3	0.203 REF		
b	0.18	0.25	0.30
D	3.90	4.00	4.10
D2	1.90	2.00	2.10
E	3.90	4.00	4.10
E2	1.90	2.00	2.10
e	0.50 BSC		
L	0.30	0.40	0.50

Notes:
1. ALL DIMENSIONS ARE IN MILLIMETER
2. REFER TO JEDEC STD MO-220

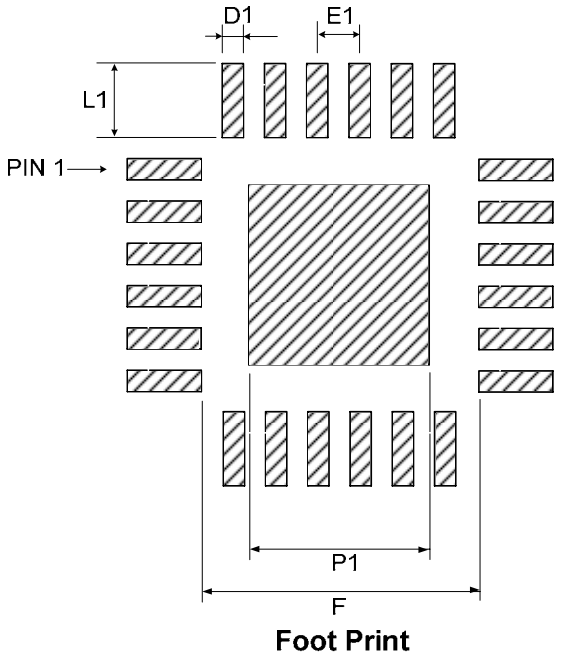
Rth j-a (QFN-24 4x4mm package) = 38°C/W
Rth j-c (QFN-24 4x4mm package) = 4.8°C/W

DIMENSION TABLE

SYMBOL	SPECIFICATION		
Pitch 0.50	Min	Nom	Max
A			0.90
B		4.00	
C		4.00	
D	0.18	.25	.30
E		.50	
L	0.30	0.40	0.50
P			2.80
D1		0.25	
E1		0.50	
L1		0.80	
P1		2.50	
F		3.20	

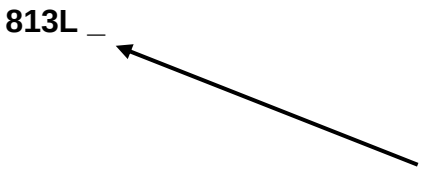
Notes:
1. Controlling dimensions are in millimeters (mm).
2. Pin #1 count orientation shall be in a counterclockwise direction as viewed in live-bug position.

LANDING PATTERN



Foot Print

PACKAGE MARKING (QFN24 PACKAGE)



Mark	Function
N	Lead-Free Package

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