

GENERAL DESCRIPTION

The N3004 is a 5 bit TTL-compatible input, digital-to-analog (DAC) programmable, synchronous buck converter with dual LDOs controller designed specifically to power the Pentium[®] II as well as the next generation of P6 family or other high performance core logic in desktop personal computer and file servers CPU applications.

The N3004 switching section provides programmability of output voltage from 1.3V to 2.05V in 50mV steps and 2.0V to 3.5V in 100 mV increments and the linear sections use external N-Channel power MOSFETs to provide fixed output voltages of 1.5V for GTL bus and 2.5V for clock.

The N3004 monitors all the output voltages. A signal Power-Good is issued when the core is within $\pm 15\%$ of the DAC setting. Additional features are built-in over-voltage, over-current protections for the core output and logic compatible shutdown.

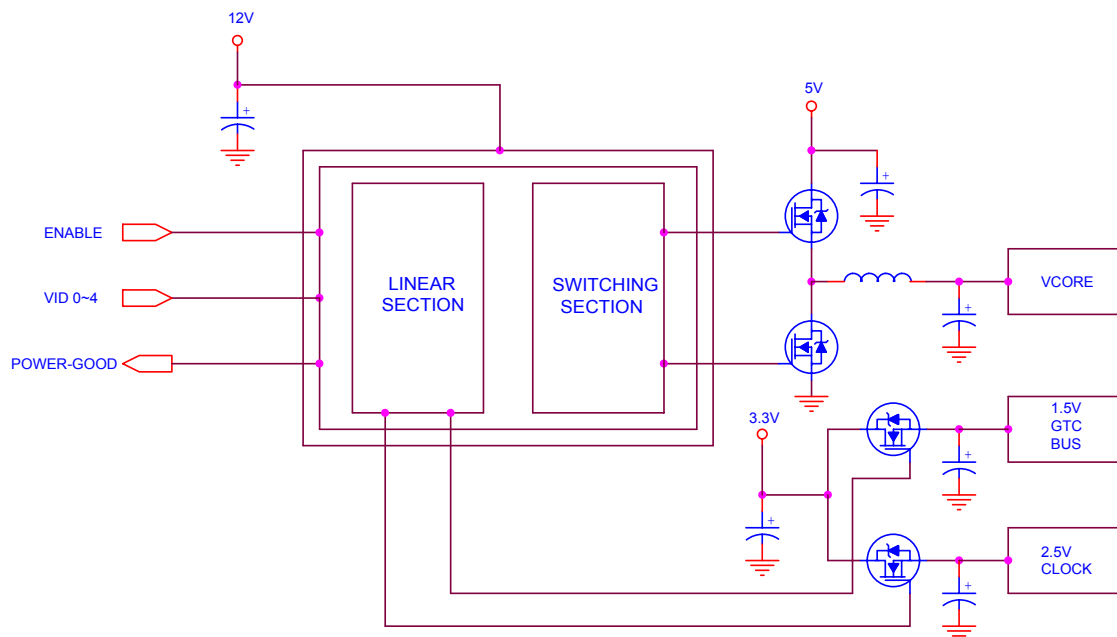
FEATURES

- Synchronous operation with high efficiency
- TTL-compatible 5 bit DAC, output voltage selection from 1.3V to 3.5V programmable
- Fast transient response
- Provides 2 regulated voltages, 1.5V and 2.5V for linear section
- Power-Good output voltage monitor
- Over-Voltage and Over-Current protection
- Logic level enable input
- High performance and low cost solution

APPLICATIONS

- Powering Pentium,[®] II, III or Deschutes, K6 and other advanced processor
- High power DC to DC controller with triple output supplies

TYPICAL APPLICATION



N3004, Motherboard Power Regulation for Computers

ABSOLUTE MAXIMUM RATINGS

PARAMETER	VALUE
Supply Voltage (V5 to GND)	10V
Supply Voltage (V12 to GND)	20V
Thermal Resistance Junction to Case, θ_{JC}	25°C/W
Thermal Resistance Junction to Ambient, θ_{JA}	85°C/W
Operating Temperature Range	0 to 70°C
Storage Temperature Range	-65 to +150°C
Junction Operating Temperature	0 to +125°C
Lead Temperature (Soldering, 10 Seconds)	300°C

ELECTRICAL SPECIFICATIONS

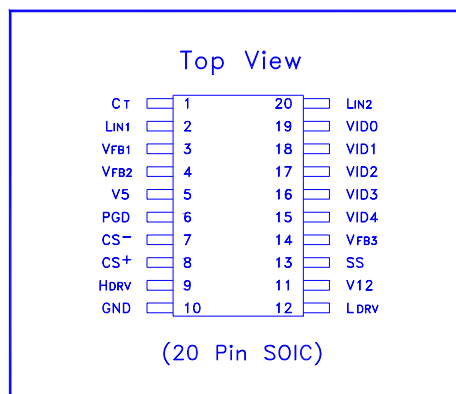
<Unless otherwise specified: V5 = 5V, V12 = 12V and T_A = 25°C>

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
SWITCHING SECTION					
DAC Output Voltage (Note 1)		0.99V _s	V _s	1.01V _s	V
DAC Output Line Regulation				0.1	%
DAC Output Temp. Variation				0.5	%
VID Input LO				0.4	V
VID Input HI		2			V
VID Input Internal Pull-Up Resistor to V5			27		KΩ
POWER GOOD SECTION					
Power Good Threshold Voltage		85		115	%
Power Good Output LO	I _L = 3mA			0.4	V
Power Good Output HI	R _L = 5KΩ pull up to 5V	4.8			V
SOFT START SECTION					
Soft Star Current	CS+ =0V, CS- =5V		10		μA
UVLO SECTION					
UVLO Threshold for V12	Supply ramping up	9.2	10	10.8	V
UVLO Hysterises for V12		0.3	0.4	.05	V
UVLO Threshold for V5	Supply ramping up	4.1	4.3	4.5	V
UVLO Hysterises for V5		0.2	0.3	0.4	V
ERROR COMPARATOR SECTION					
Input Bias Current				2	μA
Input Offset Voltage		-2		+2	mV
Delay to Output	V _{DIFF} = 10mV			100	nS

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
CURRENT LIMIT SECTION					
C.S Threshold Set Current		160	200	240	μ A
C.S Comparator Offset Voltage		-5		+5	mV
Hiccup Duty Cycle	C _{SS} = 0.1 μ F			2	%
SUPPLY CURRENT					
Operating Supply Current	CL=3000 pF				
	V5		20		
	V12		14		mA
OUTPUT DRIVERS SECTION					
Rise Time	C _L = 3,000pF		60	100	nS
Fall Time	C _L = 3,000pF		60	130	nS
Dead Band Time	C _L = 3,000pF	100	200	300	nS
OSCILLATOR SECTION					
Oscillator Frequency	C _L = 150pF		220		KHz
Oscillator Valley				0.2	V
Oscillator Peak			V5		V
LINEAR SECTIONS					
V _{FB1} & V _{FB2}		1.40	1.50	1.60	V
Input Bias Current				2	μ A
I _{DRIVER1} OR I _{DRIVER2}			50		mA

Note 1: Vs refers to the set point voltage given in Table 1.

PIN CONFIGURATIONS



PIN DEFINITIONS

Pin #	Pin Name	Pin Function Description
1	C _T	The oscillator frequency is programmed by connecting an external capacitor from this pin to GND. Operation in range of 50 KHz to 500 KHz.
2	L _{IN1}	Gate drive output regulator, Linear 1 for GTL+ or Clock supply.
3	V _{FB1}	Feedback input for L _{IN1} .
4	V _{FB2}	Feedback input for L _{IN2} .
5	V5	5V supply voltage.
6	PGD*	Open collector logic output, high if V _O within 10% of set point.
7	CS-	Current sense input (Negative), connected to the Source of the power MOSFET for the core supply.
8	CS+	Current sense input (Positive), connected to the Drain of the power MOSFET for the core supply. An external resistor programs the C.S threshold depending on the R _{DS(ON)} of the power MOSFET. An external capacitor is placed in parallel with the programming resistor to provide high frequency noise filtering.
9	H _{DRV}	High side driver output.
10	GND	This pin serves as the ground pin and must be connected directly to the ground plane. A high frequency capacitor (0.1 to 1 μ F) must be connected directly from V5 and V12 pins to this pin for noise free operation.
11	L _{DRV}	Low side driver output.
12	V12	12V supply voltage for LINEAR section. A high frequency capacitor (0.1 to 1 μ F) must be connected directly from this pin to GND pin in order to supply the peak current to the power MOSFET during the transients.
13	SS	This pin provides the soft start for the switching regulator. An internal current source charges an external capacitor that is connected from this pin to the GND which ramps up the outputs of the switching regulator, preventing the outputs from overshooting as well as limiting the input current. The second function of the soft start cap is to provide long off time (HICCUP) for the synchronous MOSFET during current limiting.
14	V _{FB3}	Feedback input for V _{CORE} .
15	VID4*	Programming input (MSB).
16	VID3*	Programming input.
17	VID2*	Programming input.
18	VID1*	Programming input.
19	VID0*	Programming input (LSB).
20	L _{IN2}	Gate drive output regulator, Linear 2 for GTL+ or Clock supply.

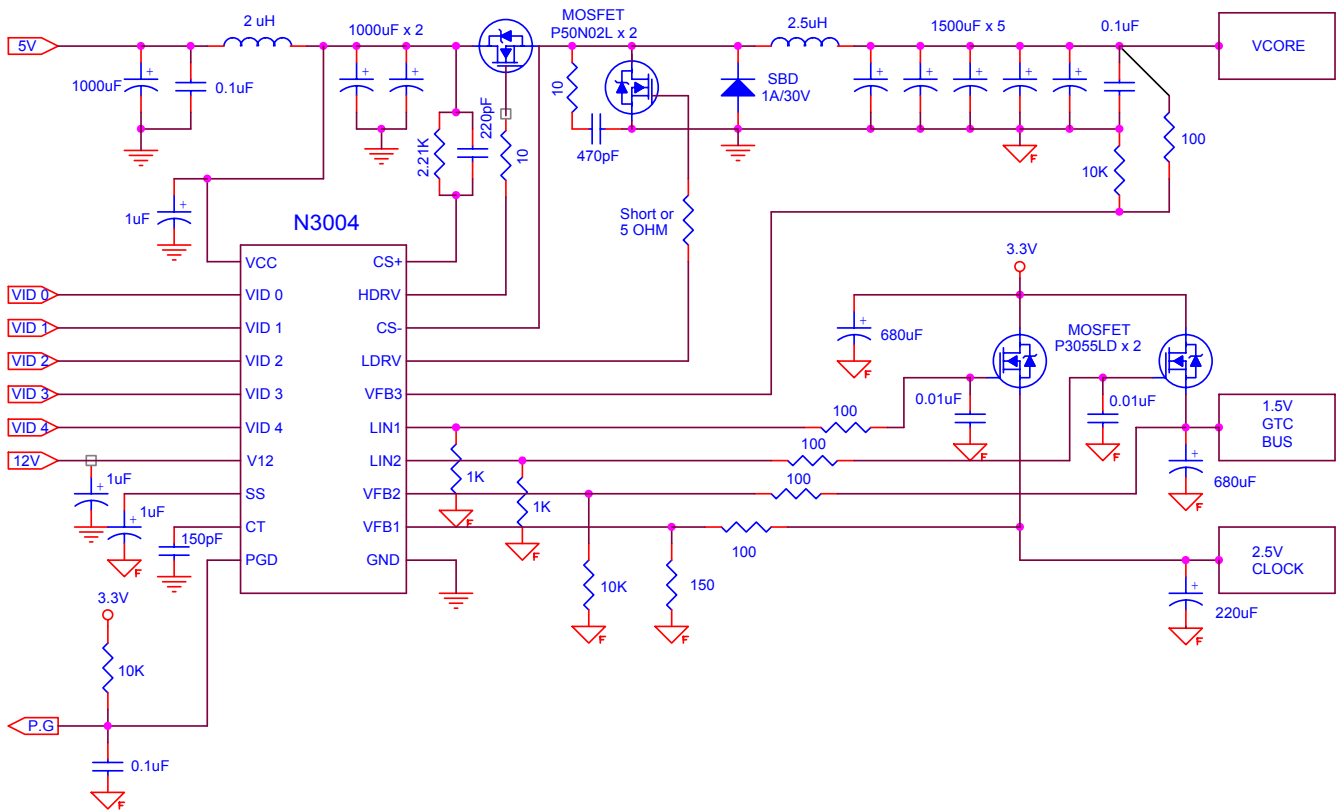
* : All logic level inputs and outputs are open collector TTL compatible.

OUTPUT SET POINT VOLTAGE vs VID CODES

– Table 1 –

Vs	VID4	VID3	VID2	VID1	VID0
1.30	0	1	1	1	1
1.35	0	1	1	1	0
1.40	0	1	1	0	1
1.45	0	1	1	0	0
1.50	0	1	0	1	1
1.55	0	1	0	1	0
1.60	0	1	0	0	1
1.65	0	1	0	0	0
1.70	0	0	1	1	1
1.75	0	0	1	1	0
1.80	0	0	1	0	1
1.85	0	0	1	0	0
1.90	0	0	0	1	1
1.95	0	0	0	1	0
2.00	0	0	0	0	1
2.05	0	0	0	0	0
2.00	1	1	1	1	1
2.10	1	1	1	1	0
2.20	1	1	1	0	1
2.30	1	1	1	0	0
2.40	1	1	0	1	1
2.50	1	1	0	1	0
2.60	1	1	0	0	1
2.70	1	1	0	0	0
2.80	1	0	1	1	1
2.90	1	0	1	1	0
3.00	1	0	1	0	1
3.10	1	0	1	0	0
3.20	1	0	0	1	1
3.30	1	0	0	1	0
3.40	1	0	0	0	1
3.50	1	0	0	0	0

APPLICATION CIRCUIT



SOIC-20 (DW) MECHANICAL DATA

Dimension	mm			Dimension	mm		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	12.6		13.0	H	0.4		1.27
B	7.3		7.7	I	0.23		0.32
C	10		10.65	J	0.25		0.74
D	0.33		0.51	K	0°		8°
E		1.27		L			
F	2.1	2.3	2.5	M			
G	0.1		0.3	N			

