

8A SYNCHRONOUS BUCK SWITCHING REGULATOR WITH INTERNAL BIASING AND ADJUSTABLE FREQUENCY

PRELIMINARY DATA SHEET

Pb Free Product

DESCRIPTION

The NX9521 is synchronous buck switching converter in multi chip module designed for step down DC to DC converter applications. They are optimized to convert bus voltages from 5V to 25V to as low as 0.8V output voltage. The output current can be up to 8A. An internal regulator converts bus voltage to 5V, which provides voltage supply to internal logic and driver circuit. The NX9521 has programmable frequency feature and operates at 300kHz when Rt pin is open, employs programmable loss-less current limiting by sensing the R_{ds(on)} of synchronous MOSFET followed by hiccup feature. Feedback under voltage triggers hiccup.

Other features of the device are: Over voltage protection, thermal shutdown, 5V gate drive, Adaptive deadband control, Internal digital soft start, V_{cc} undervoltage lock out and shutdown capability via the comp pin. NX9511 is available in 32 Lead 5x5 MCM package.

- Switching Controller and MOSFETs in one package
- Bus voltage operation from 5V to 25V
- Programmable frequency
- Internal Digital Soft Start Function
- Output current up to 8A
- Prebias Startup
- Less than 50 nS adaptive deadband
- Programmable loss-less Over Current Protection
- No negative spike at V_{out} during startup and shutdown
- Over Voltage Protection triggers latch out
- Power Good indicator available
- Pb-free and RoHS compliant

FEATURES

APPLICATIONS

- Graphic Card on board converters
- Low profile on board DC to DC such as 12V to 3.3V, 2.5V or 1.8V
- ADSL Modem

TYPICAL APPLICATION

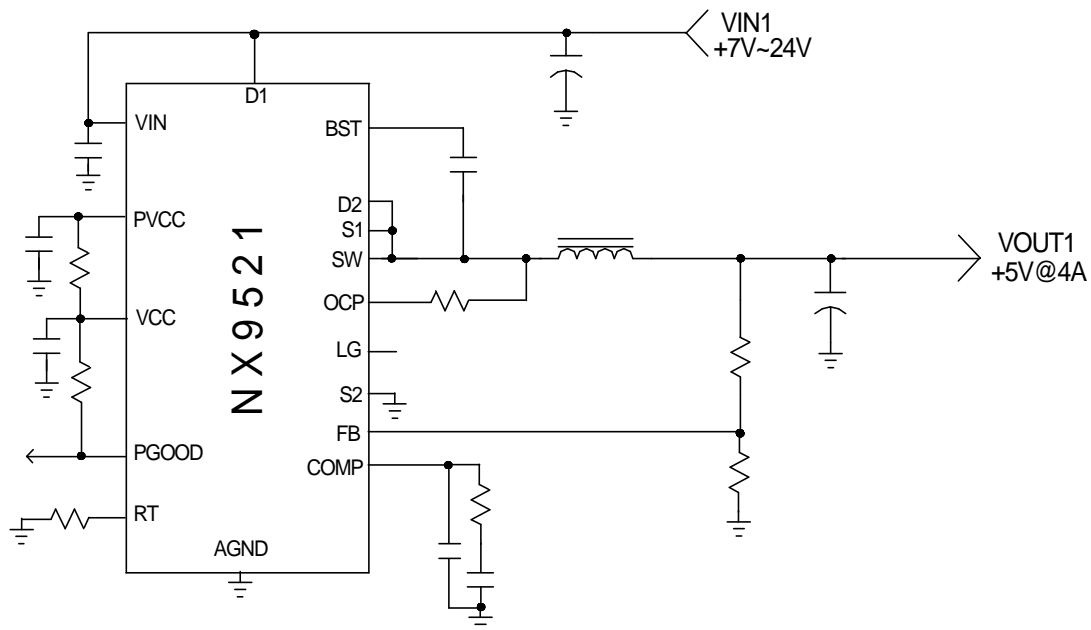


Figure 1 - Typical application of 9521

ORDERING INFORMATION

Device	Temperature	Package	Frequency	Pb-Free
NX9521CMTR	0 to 70°C	5x5MCM-32L	300kHz to 1MHz	Yes

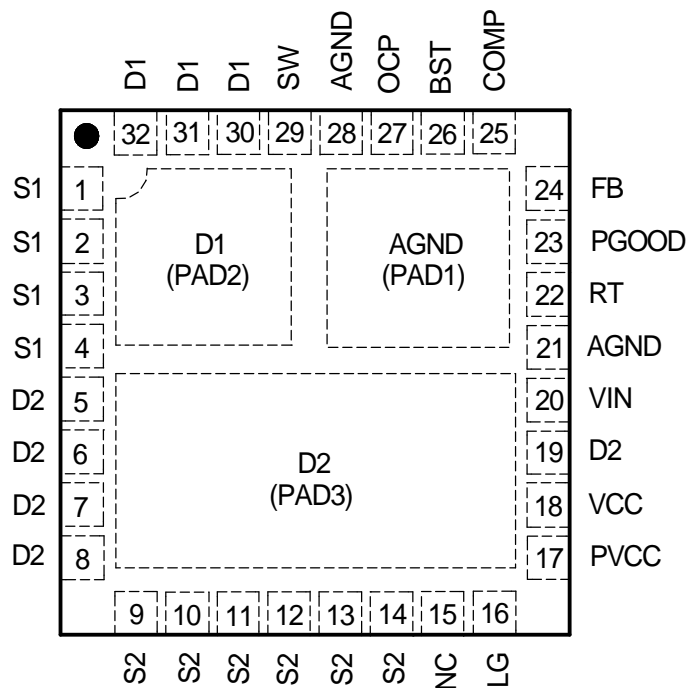
ABSOLUTE MAXIMUM RATINGS

PVCC, VCC to GND & BST to SW voltage	-0.3V to 6.5V
Vin to GND	25V
BST to GND Voltage	-0.3V to 30V
D2, S1, SW to GND	-2V to 30V
All other pins	-0.3V to VCC+0.3V or 6.5V
Storage Temperature Range	-65°C to 150°C
Operating Junction Temperature Range	-40°C to 125°C
ESD Susceptibility	2kV
Power Dissipation	TBD
Output Current	TBD

CAUTION: Stresses above those listed in "ABSOLUTE MAXIMUM RATINGS", may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

PACKAGE INFORMATION

32-LEAD PLASTIC MCM 5 x 5



ELECTRICAL SPECIFICATIONS

Unless otherwise specified, these specifications apply over $V_{IN} = 12V$ and $T_A = 0$ to $70^\circ C$. Typical values refer to $T_A = 25^\circ C$. Low duty cycle pulse testing is used which keeps junction and case temperatures equal to the ambient temperature.

PARAMETER	SYM	Test Condition	Min	TYP	MAX	Units
Reference Voltage						
Ref Voltage	V_{REF}	$4.5V < V_{CC} < 5.5V$		0.8		V
Ref Voltage line regulation				0.4		%
Supply Voltage(Vcc)						
V_{CC} Voltage Range	V_{CC}		4.5	5	5.5	V
V_{CC} Supply Current (Static)	I_{CC} (Static)	Outputs not switching		3		mA
PV_{CC} Supply Current (Dynamic)	I_{CC} (Dynamic)			5		mA
Supply Voltage(V_{BST})						
V_{BST} Supply Current (Dynamic)	I_{BST} (Dynamic)			5		mA
Under Voltage Lockout						
V_{CC} -Threshold	V_{CC_UVLO}	V_{CC} Rising		4.2		V
V_{CC} -Hysteresis	V_{CC_Hyst}	V_{CC} Falling		0.22		V
Supply Voltage(V_{in})						
V_{in} Voltage Range	V_{in}		4.7		25	V
Input Voltage Current		$V_{in}=24V$		24	40	μA
V_{in} UVLO						
V_{in} -Threshold	V_{in_UVLO}	V_{CC} Rising		4.5		V
V_{in} -Hysteresis	V_{in_Hyst}	V_{CC} Falling		0.5		V
SS						
Soft Start time	T_{ss}	$F_s=300Khz$		3.4		mS
Oscillator (Rt)						
Frequency	F_s	$R_t=open$		300		kHz
Ramp-Amplitude Voltage	V_{RAMP}			1.6		V
Max Duty Cycle				84		%
Min Duty Cycle					0	%
Error Amplifiers						
Transconductance				2000		μmho
Input Bias Current	I_b			10		nA
Comp SD Threshold				0.3		V
FBUVLO						
Feedback UVLO threshold		percent of nominal	65	70	75	%
OCP						
OCP current				32		μA
Power Good(Pgood)						
Threshold Voltage as % of V_{ref}		FB ramping up		90		%
Hysteresis				5		%
Output Stage						
High Side MOSFET $R_{DS(ON)}$				18		ohm
Low Side MOSFET $R_{DS(ON)}$				18		ohm
Output Current				8		A

PARAMETER	SYM	Test Condition	Min	TYP	MAX	Units
Over Voltage						
Over Voltage Trip Point			115	120		%Vref
Hysteresis				8		%Vref
Over Voltage Delay				2		cycle
Over temperature						
Threshold				150		°C
Hysteresis				20		°C

PIN DESCRIPTIONS

PIN #	PIN SYMBOL	PIN DESCRIPTION
1-4	S1	S1 is the source of high side MOSFET.
5-8,19	D2	D2 is the drain of low side MOSFET.
9-14	S2	S2 is the source of high side MOSFET.
15	NC	Not used.
16	LG	Low side gate driver output for monitoring.
17	PVCC	An internal 5V regulator provides this supply voltage for the low side fet drivers. A high frequency 1uF ceramic cap must be connected from this pin to the PGND pin as close as possible
18	VCC	Supply voltage for the internal logic circuit. A 1uF high frequency ceramic capacitor must be connected from this pin to GND pin.
20	VIN	Voltage supply for the internal 5V regulator.
22	RT	Oscillator's frequency can be set by using an external resistor from this pin to GND. When RT pin is open, the frequency is 200kHz.
23	PG	An open drain output that requires a pull up resistor to Vcc or a voltage lower than Vcc. When FB pin reaches 90% of the reference voltage PGOOD transitions from LO to HI state.
24	FB	This pin is the error amplifier inverting input. This pin is also connected to the output UVLO comparator. When this pin falls below 0.48V, both HDRV and LDRV outputs are in hiccup.
25	COMP	This pin is the output of the error amplifier and together with FB pin is used to compensate the voltage control feedback loop. This pin is also used as a shut down pin. When this pin is pulled below 0.3V, both drivers are turned off and internal soft start is reset.
26	BST	This pin supplies voltage to the high side driver. A high frequency ceramic capacitor of 0.1 to 1 uF must be connected from this pin to SW pin.
27	OCP	This pin is connected to the drain of the external low side MOSFET and is the input of the over current protection(OCP) comparator. An internal current source is flown to the external resistor which sets the OCP voltage across the Rds-on of the low side MOSFET. Current limit point is this voltage divided by the Rds-on.
21,28	AGND	Analog ground.
29	SW	This pin should be connected to the source of the high side MOSFET S1 and drain of the low side MOSFET D2.
30-32	D1	Drain of High side MOSFET.

BLOCK DIAGRAM

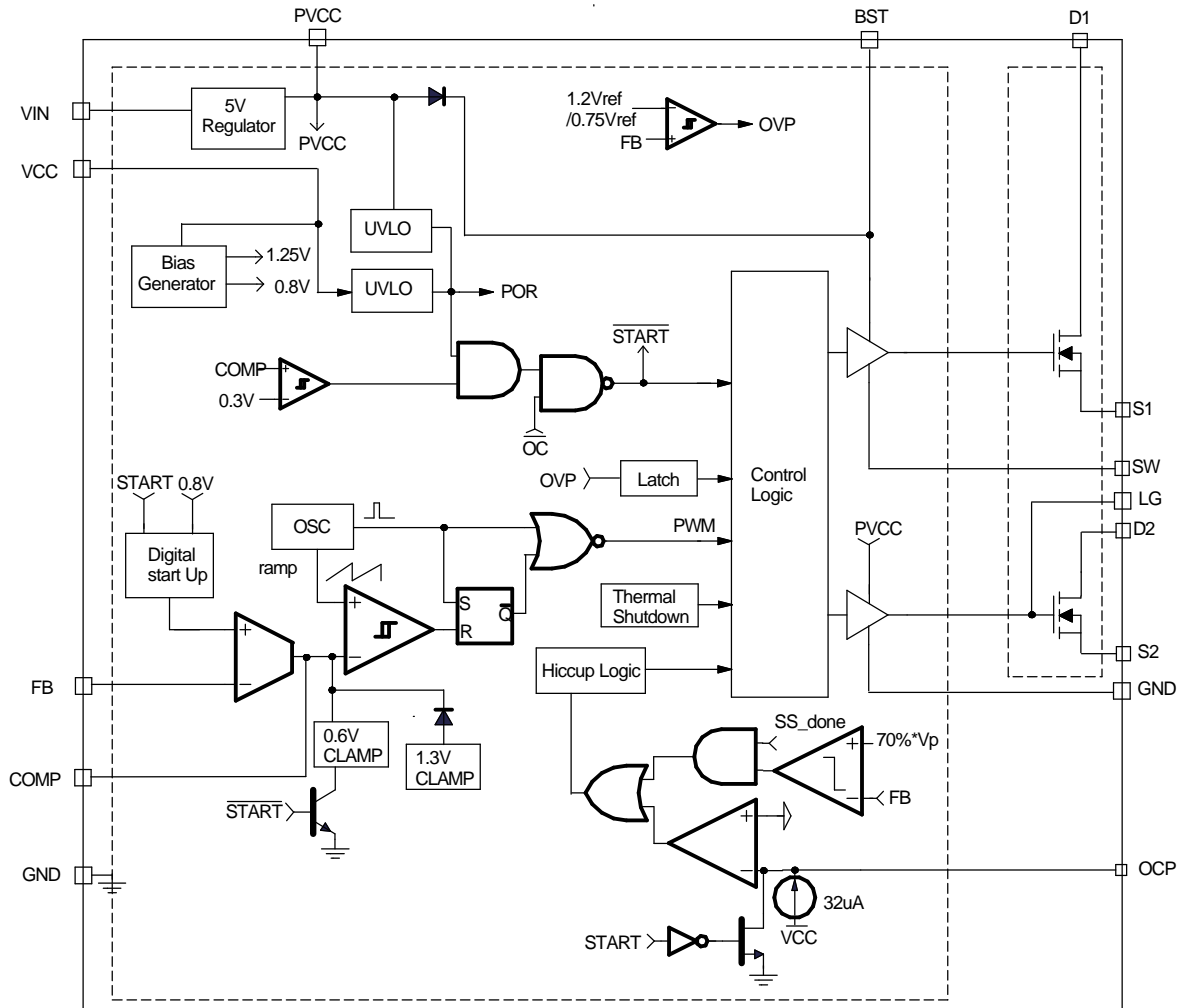


Figure 2 - Simplified block diagram of the NX9521