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DS V1p0 Revised Nov 2012

INN8186

Highly Integrated LNB Supply and Control Voltage Regulator

For details, check for samples: INN8186

Features

- Low noise output to avoid sensitivity of Can Tuner and DISH's LNA dropping down Noise <+/-40mV@300MHz BWL Noise <+/-20mV@20MHz BWL
- Single chip power solution with 650mV Vpp 22KHz tone control signal transferred to output
- LNB Voltages (2 levels: 14.3V and 19.3V) compatible with common standards
- External 22KHz tone input
- Integrated DC DC boost converter and high efficiency (typ. 93%) with integrated Power Mosfet
- Integrated low Noise Linear Regulator
- Integrated power switches and current sensing
- Internal overcurrent and over temperature protection
- Provides up to 450mA continuous load current
- Output current limit of 500mA typical, with 48ms timer
- Push-pull output stage minimizes 14 → 19V and 19V →14V output transition times
- Internal Short Protection
- Meet DiSEqC1.x protocol
- 5.0V, 3.3V, 2.5V, 1.8V, 1.2 and 1.05V logic compatible
- 1.0MHz Switch Frequency BOOST
- Highly Integrated with fewer external components

Applications

- LNB Power supply and control for Satellite Set-Top Box
- Digital STB
- Satellite TV cards

Descriptions

Intended for analog and digital satellite receivers/sat-TV, sat-OC cards, the INN8186 is a monolithic voltage regulator and interface IC, packaged in SOP8EP, specifically designed to provide the 14/19V power supply with high efficiency and the 22kHz tone signaling to the LNB down-converter in the antenna dish or to the multi-switch box.

INN8186 consists of a boost converter and a low-noise linear regulator along with the circuitry required for tone injection and pin controllable interface. The device makes the total LNB supply design simple, efficient and compact with low external component count

The external modulation input (TONE pin) can accept a tome modulated DiSEqC command and transfer it symmetrically to the output to meet DiSEqC 1.x protocol.



Confidential

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ORDERING INFORMATION

ТА	PACKAGE	ORDERING PART NUMBER	PIN	TRANSPORT MEDIA, QUANTITY	ECO PLAN
-20℃ to 85℃	SOP8EP	INN8186 SCCTM	9	Tape and Reel 2500	Green (RoHS & no Sb/Br)

ABOSOLUTE MAXIMUM RATINGS

Over operating free-air temperature range (unless otherwise noted)

ITEMS	NAME	VALUE	UNIT	
	VIN, VSW	-0.3 to 27	V	
	VCP	-0.3 to 30	V	
Voltago Bongo	LX (10ns transient)	-2 to 40	V	
vollage Range	VLNB (10ns transient)	-2 to 27	V	
	S18V	-0.3 to 5.5	V	
	EN	-0.3 to 8	V	
TJ	Operation Junction	-40 to +150	°C	
Tstg	Storage temperature	-55 to +150	°C	

DISSIPATION RATINGS

(2oz. trace and copper pad)

PACKAGE	θJA	θJC	UNIT
SOP8EP	60	40	°C/W

RECOMMENDED OPERATING CONDITIONS

Over operating free-air temperature range(unless otherwise noted)

		MIN	MAX	UNIT
Voltage	Supply input voltage range, VIN	9	14	V
	LX	-0.1	30	V
	VSW, VLNB	-0.1	23	V
	S18V	-0.1	5	V
	EN	-0.1	7.0	V
	Ground (Exposed Pad)	-0.1	+0.1	V
Та	Operating free-air temperature	-20	85	°C
TJ	Operating junction temperature	-40	125	$^{\circ}$



ELECTRICAL CHARACTERISTICS

Over operating free-air temperature range(unless otherwise noted)

VIN=12V, TA **=25**℃

Supply Current VIN Operating supply voltage range 9.0 12.0 14.0 V VUVL0 Input Under Voltage Lockout Threshold VIN Rising 5.5 6.5 7.5 V VUVL0_Hys Input Under Voltage Lockout Threshold Hysteresis VIN current, Ta=25 TC, FE=3.3V, VLNB=19V, TONE=0V 0.1 V V V VIN Operating supply current VIN current, Ta=25 TC, FE=3.3V, VLNB=19V, TONE=0V 2.0 3.0.0 mA VIN Operating supply current VIN current, Ta=25 TC, FE=3.3V, VLNB=19V, TONE=0V 2.0 3.0.0 mA VIN Operating supply current VENB=19V, TONE=0V 2.0 3.0.0 mA VDUT Disable Supply Current VEN=0V 2.0 3.0.0 mA VOUT Output Voltage VEN=0V 13.9 14.3 14.7 V VOUT VIN Line Regulation VIN=9V to 14V, VLNB=18.3V 14.3 14.7 V Line VIN Buitput load regulation ILoad=0MA to 450mA, Vout=18.3V 14.3 14.7 V Load	PARAMETER		TEST CONDITIONS	CONDITIONS MIN TYP M		MAX	UNIT
VIN Operating supply voltage range Operating supply voltage range 9.0 12.0 14.0 V VUVLO Input Under Voltage Lockout Threshold VIN Rising 5.5 6.5 7.5 V VUVLO_Hya Input Under Voltage Lockout Threshold Hysteresis VIN current, Ta=25 °C , EN=3.3V, VLNB=19V, TONE=0V 0.1 V V V MiN Disable Supply current VIN current, Ta=25 °C , EN=3.3V, VLNB=19V, Z2KHz Tone Input 20 30.0 mA ISDN Disable Supply Current VEN=0V 2 3.5 mA VOUT Disable Supply Current VEN=1, S18V="0" 13.9 14.3 14.7 V VOUT VIN Line Regulation VIN=9V to 14V, VLNB=18.3V 12.0 MV MV Regulation Incar> Regulation Incar> Siow rate 255mA/us, Cout=0.2µF 12.0 mV MV Vripple Linear Regulator Drop Voltage VEN=3.0V, Loab=450mA 1.2 V MV Regulation Load Regulator Drop Voltage VEN=3.0V, Loab=450mA 1.2 V MV	Supply Current						
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Threshold Input Under Voltage Lockout Threshold Hysteresis 0.1 V VUVLO_Hys Input Under Voltage Lockout Threshold Hysteresis VIN current, Ta=25 °C, EN=3.3V, VLNB=19V, TONE=0V 5 .00 mA VIN Operating supply current VENB=19V, TONE=0V 20 30.0 mA VIN Disable Supply Current VEN=0V 2 3.5 mA Output Voltage VEN=0V 2 3.5 mA Output Voltage VEN=1, S18V="0" 13.9 14.3 14.7 V Vour Output Voltage VEN=1, S18V="1" 18.8 19.3 20.2 V Line VIN Line Regulation VIN=9V to 14V, VLNB=18.3V 4 40 mV Regulation ILoan=0mA to 450mA, Vout=18.3V 120 mV Regulation Slow rate 255mA/us, Cout=0.2µF mV 300MHz BWL through 100cm +/-20 mV Vripple Ripple and noise on VLNB output 200MHz BWL through 100cm +/-20 mV 300MHz BWL through 100cm mV LILMIT Output Current	Vuvlo	Input Under Voltage Lockout	VIN Rising	5.5	6.5	7.5	V
VUVLO_Hys Input Under Voltage Lockout Threshold Hysteresis 0.1 V ININ Approximate Notice Provided Hysteresis VIIN current, TA=25 °C, EN=3.3V, VLNB=19V, TONE=0V 5 9.0 mA VIN current, TA=25 °C, EN=3.3V, VLNB=19V, 22KHz Tone Input 20 30.0 mA Ison Disable Supply Current VEN=0V 2 3.5 mA Output Voltage VEN=0V 2 3.5 mA Vour Output Voltage VEN=0V 2 3.5 mA Vour Output Voltage VEN=0V 2 3.5 mA Vour Output Voltage VEN=1, S18V="0" 13.9 14.3 14.7 V Vour Output Voltage VEN=1, S18V="0" 18.8 19.3 20.2 V Line VIN Line Regulation VIN=9V to 14V, VLNB=18.3V 4 40 mV Regulation ILoAD=0mA to 450mA, Vout=18.3V 120 mV N Vripple Ripple and noise on VLNB output Bab Provide Mark Source 10.2µF VIN 300MHz BWL through 100cm		Threshold					
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IVIN Operating supply current VLNB=19V, TONE=0V VIN current, Ta=25 °C, EN=3.3V, VLNB=19V, 22KHz Tone Input 20 30.0 mA ISDN Disable Supply Current VEN=0V 2 3.5 mA Output Voltage VEN=0V 2 3.5 mA Output Voltage VEN=1, S18V="0" 13.9 14.3 14.7 V Vour Output Voltage VEN=1, S18V="1" 18.8 19.3 20.2 V Line VIN Line Regulation VIN=9V to 14V, VLNB=18.3V 4 40 mV Regulation VLNB output load regulation ILoAD=0mA to 450mA, Vout=18.3V 120 mV Regulation Iload VLNB output load regulation ILoAD=0mA to 450mA, Vout=18.3V 120 mV Vripple Ripple and noise on VLNB 200HHz BWL close to LNB chip +/-20 mV 300HHz BWL through 100cm +/-20 mV 300HHz BWL through 100cm +/-40 mV Vripple Output Current limit VLNB=14.3V 500 550 mA ILIMIT			VIN current, T _A =25 $^{\circ}$ C , EN=3.3V,		5	9.0	mA
NM Openating Supply output VIN current, TA=25 °C , EN=3.3V, VLNB=13V, VLNB=13V, 22KHz Tone Input 20 30.0 mA ISDN Disable Supply Current VEN=0V 2 3.5 mA Output Voltage VEN=0V 2 3.5 mA Output Voltage VEN=1, S18V="0" 13.9 14.3 14.7 V Vour Output Voltage VEN=1, S18V="0" 18.8 19.3 20.2 V Line VIN Line Regulation VIN=9V to 14V, VLNB=18.3V 4 40 mV Regulation ILoAD=0mA to 450mA, Vout=18.3V 120 mV Regulation ILoAD=0mA to 450mA, Vout=18.3V 120 mV Vripple Ripple and noise on VLNB VEN=3.0V, ILOAD=450mA 1.2 V Vripple Ripple and noise on VLNB 200MHz BWL close to LNB chip +/-20 mV ULIMIT Output Current limit VLNB=14.3V 500 550 mA ILIMIT Output Current limit VLNB=19.3V 500 550 mA	IVIN	Operating supply current	VLNB=19V, TONE=0V				
ISDN Disable Supply Current VENB=19V, 22KHz Tone Input 2 3.5 mA Output Voltage 2 3.5 mA Output Voltage VEN=0V 2 3.5 mA Vout Output Voltage VEN=1, S18V="0" 13.9 14.3 14.7 V Vout Output Voltage VEN=1, S18V="0" 18.8 19.3 20.2 V Line VIN Line Regulation VIN=9V to 14V, VLNB=18.3V 4 40 mV Regulation ILoAD=0mA to 450mA, Vout=18.3V 4 40 mV Drop Voltage Linear Regulator Drop Voltage VEN=3.0V, ILOAD=450mA 1.2 mV Vripple Ripple and noise on VLNB output 20MHz BWL close to LNB chip +/-20 mV MV 300MHz BWL through 100cm co-axial cable. +/-40 mV LIMIT Output Current limit VLNB=14.3V 500 550 mA Short and OverLoAD Dynamic Overload ON time Output shorted to GND 45 ms		operating supply current	VIN current, TA=25 $^\circ\!\mathrm{C}$, EN=3.3V,		20	30.0	mA
ISDN Disable Supply Current VEN=0V 2 3.5 mA Output Voltage VEN=1, S18V="0" 13.9 14.3 14.7 V Vour Output Voltage VEN=1, S18V="0" 18.8 19.3 20.2 V Line VIN Line Regulation VIN=9V to 14V, VLNB=18.3V 4 40 mV Regulation ILoAD=0mA to 450mA, Vout=18.3V 4 40 mV Regulation ILoAD=0mA to 450mA, Vout=18.3V 4 40 mV Prop Voltage Linear Regulator Drop Voltage VEN=3.0V, ILOAD=450mA 1.2 with the second to the second tot			VLNB=19V, 22KHz Tone Input				
Output Voltage VEN=1, S18V="0" 13.9 14.3 14.7 V Vour Output Voltage VEN=1, S18V="0" 18.8 19.3 20.2 V Line VIN Line Regulation VIN=9V to 14V, VLNB=18.3V 4 40 mV Regulation VLNB output load regulation ILoab=0mA to 450mA, Vout=18.3V 120 mV Regulation Slow rate 255mA/us, Cout=0.2µF 11.2 V Drop Voltage Linear Regulator Drop Voltage VEN=3.0V, ILoab=450mA 1.2 V Vripple Ripple and noise on VLNB output load regulation VEN=3.0V, ILoab=450mA 1.2 W Vripple Output Current limit VEN=3.0V, ILoab=450mA 1.2 W LIMIT Output Current limit VEN=3.0V, ILoab=450mA 1.2 W LIMIT Output Current limit VEN=3.0V, ILoab=450mA 1.2 W LIMIT Output Current limit VENB=14.3V 500 550 mA LIMIT Output Current limit VENB=14.3V 500 550 mA <	ISDN	Disable Supply Current	Ven=0V		2	3.5	mA
Vour Output Voltage VEN=1, S18V="0" 13.9 14.3 14.7 V Line VIN Line Regulation VIN=9V to 14V, VLNB=18.3V 18.8 19.3 20.2 V Line VIN Line Regulation VIN=9V to 14V, VLNB=18.3V 4 40 mV Regulation VLNB output load regulation ILoad=0mA to 450mA, Vout=18.3V 120 mV Regulation VINeare Regulator Drop Voltage VEN=3.0V, ILoad=450mA 1.2 V Drop Voltage Linear Regulator Drop Voltage VEN=3.0V, ILoad=450mA 1.2 V Vripple Ripple and noise on VLNB 20MHz BWL close to LNB chip +/-20 mV 300MHz BWL through 100cm +/-40 mV mV co-axial cable. mV ILIMIT Output Current limit VLNB=14.3V 500 550 mA ILIMIT Output Current limit VLNB=19.3V 500 550 mA ILIMIT Dynamic Overload ON time Output shorted to GND 45 mS	Output Voltage						
Vour Output Voltage VEN=1, S18V="1" 18.8 19.3 20.2 V Line VIN Line Regulation VIN=9V to 14V, VLNB=18.3V 4 40 mV Regulation Load VLNB output load regulation ILoaD=0mA to 450mA, Vout=18.3V 120 mV Regulation Slow rate 255mA/us, Cout=0.2µF mV mV Drop Voltage Linear Regulator Drop Voltage VEN=3.0V, ILoaD=450mA 1.2 V Vripple Ripple and noise on VLNB output Course on VLNB output Current limit VLNB=14.3V 500 550 mA LILIMIT Output Current limit VLNB output short 125 200 mA Short and OverLoad ON time Output shorted to GND 45 ms			VEN=1, S18V="0"	13.9	14.3	14.7	V
VOOL VEN=1, S18V="1" 18.8 19.3 20.2 V Line VIN Line Regulation VIN=9V to 14V, VLNB=18.3V 4 40 mV Regulation VLNB output load regulation ILOAD=0mA to 450mA, Vout=18.3V 120 mV Load VLNB output load regulation ILOAD=0mA to 450mA, Vout=18.3V 120 mV Regulation Linear Regulator Drop Voltage VEN=3.0V, ILOAD=450mA 1.2 V Drop Voltage Linear Regulator Drop Voltage VEN=3.0V, ILOAD=450mA 1.2 V Vripple Ripple and noise on VLNB output load regulation 20MHz BWL close to LNB chip +/-20 mV JLIMIT Output Current limit VLNB=14.3V 500 550 mA VLNB output short 125 200 mA VLNB=19.3V 500 550 mA VLNB=19.3V 500 550 mA VLNB=19.3V 500 550 mA VLNB=19.3V 500 550 mA TON_OVERLOAD Dynamic Overload ON time Output shorted to GND 45 ms <td>Vout</td> <td>Output Voltage</td> <td></td> <td></td> <td></td> <td></td> <td></td>	Vout	Output Voltage					
Line RegulationVIN Line Regulation VIN=9V to 14V, VLNB=18.3V440mVRegulationVLNB output load regulation RegulationILoad=0mA to 450mA, Vout=18.3V120mVRegulationILoad=0mA to 450mA, Vout=18.3V120mVDrop VoltageLinear Regulator Drop VoltageVEN=3.0V, ILoad=450mA1.2VDrop VoltageLinear Regulator Drop VoltageVEN=3.0V, ILoad=450mA1.2VVrippleRipple and noise on VLNB output20MHz BWL close to LNB chip+/-20mV300MHz BWL through 100cm co-axial cable.+/-40mVmVVLNB=14.3V500550mAVLNB=19.3V500550mAShort and Overload ON timeOutput shorted to GND45msTon_OVERLOADDynamic Overload ON timeOutput shorted to GND45ms	001		VEN=1, S18V="1"	18.8	19.3	20.2	V
Line VIN Line Regulation VIN=9V to 14V, VLNB=18.3V 4 40 mV Regulation VLNB output load regulation ILoad=0mA to 450mA, Vout=18.3V 120 mV Regulation Slow rate 255mA/us, Cout=0.2µF 120 mV Drop Voltage Linear Regulator Drop Voltage VEN=3.0V, ILoad=450mA 1.2 V Mipple Ripple and noise on VLNB 20MHz BWL close to LNB chip +/-20 mV Mipple Mipple VINB=14.3V 500 550 mA ILIMIT Output Current limit VLNB=14.3V 500 550 mA Short and Overload ON time Output shorted to GND 45 ms							
Regulation Load VLNB output load regulation ILOAD=0mA to 450mA, Vout=18.3V 120 mV Regulation Slow rate 255mA/us, Cout=0.2μF mV mV Drop Voltage Linear Regulator Drop Voltage VEN=3.0V, ILOAD=450mA 1.2 V Main Vipple Ripple and noise on VLNB 20MHz BWL close to LNB chip +/-20 mV Mutual 300MHz BWL through 100cm +/-40 mV mV Vripple Output Current limit VLNB=14.3V 500 550 mA ILIMIT Output Current limit VLNB=14.3V 500 550 mA Short and Overbad Dynamic Overload ON time Output shorted to GND 45 ms	Line	VIN Line Regulation	VIN=9V to 14V, VLNB=18.3V		4	40	mV
Load VLNB output load regulation ILoAD=0mA to 450mA, Vout=18.3V 120 mV Regulation Slow rate 255mA/us, Cout=0.2µF 120 mV Drop Voltage Linear Regulator Drop Voltage VEN=3.0V, ILoAD=450mA 1.2 V Vripple Ripple and noise on VLNB output 20MHz BWL close to LNB chip +/-20 mV Voltage Viput VINB=14.3V 500 550 mA ILIMIT Output Current limit VLNB=14.3V 500 550 mA VLNB=19.3V 500 550 mA Short and Overload ON time Output shorted to GND 45 ms	Regulation						
RegulationSlow rate 255mA/us, Cout=0.2μFDrop VoltageLinear Regulator Drop VoltageVEN=3.0V, ILoAD=450mA1.2VVrippleRipple and noise on VLNB output20MHz BWL close to LNB chip+/-20mV300MHz BWL through 100cm co-axial cable.+/-40mVmVILIMITOutput Current limitVLNB=14.3V500550mAVLNB=19.3V500550mAShort and Overload ON timeOutput shorted to GND45ms	Load	VLNB output load regulation	ILOAD=0mA to 450mA, Vout=18.3V		120		mV
Drop Voltage Linear Regulator Drop Voltage VEN=3.0V, ILOAD=450mA 1.2 V Vripple Ripple and noise on VLNB output 20MHz BWL close to LNB chip +/-20 mV 300MHz BWL through 100cm +/-40 mV mV ILIMIT Output Current limit VLNB=14.3V 500 550 mA VLNB output Short 125 200 mA Short and Overload ON time Output shorted to GND 45 ms	Regulation		Slow rate 255mA/us, Cout=0.2µF				
Vripple Ripple and noise on VLNB 20MHz BWL close to LNB chip +/-20 mV 300MHz BWL through 100cm +/-40 mV co-axial cable. v////////////////////////////////////	Drop Voltage	Linear Regulator Drop Voltage	VEN=3.0V, ILOAD=450mA		1.2		V
Vripple Npple and noise on VLNB 300MHz BWL through 100cm +/-40 mV 0utput co-axial cable. vLNB=14.3V 500 550 mA ILIMIT Output Current limit VLNB=14.3V 500 550 mA VLNB=19.3V 500 550 mA Short and Overload Protection VLNB=19.3V 500 550 mA TON_OVERLOAD Dynamic Overload ON time Output shorted to GND 45 ms		Ripple and noise on VLNB	20MHz BWL close to LNB chip		+/-20		mV
ILIMIT Output Current limit vLNB=14.3v 500 550 mA VLNB output Short 125 200 mA VLNB=19.3V 500 550 mA Short and Overload Protection Ton_overload Dynamic Overload ON time Output shorted to GND 45 ms	Vripple		300MHz BWL through 100cm	+/-40		mV	
ILIMIT Output Current limit VLNB=14.3V 500 550 mA VLNB output short 125 200 mA VLNB=19.3V 500 550 mA Short and Overload Protection TON_OVERLOAD Dynamic Overload ON time Output shorted to GND 45 ms		ouiput	co-axial cable.				
ILIMIT Output Current limit VLNB output short 125 200 mA VLNB=19.3V 500 550 mA Short and Overload Protection VLNB=19.3V Solution TON_OVERLOAD Dynamic Overload ON time Output shorted to GND 45 ms			VLNB=14.3V		500	550	mA
VLNB=19.3V 500 550 mA Short and Overload Protection Ton_overload ON time Output shorted to GND 45 ms	Ilimit	Output Current limit	VLNB output short		125	200	mA
Short and Overload Protection Ton_overload Dynamic Overload ON time Output shorted to GND 45 ms			VLNB=19.3V		500	550	mA
TON_OVERLOAD Dynamic Overload ON time Output shorted to GND 45 ms	Short and Over	load Protection					
	TON_OVERLOAD	Dynamic Overload ON time	Output shorted to GND		45		ms
I OFF_OVERLOAD Dynamic Overload OFF time Output shorted to GND 1800 ms	TOFF_OVERLOAD	Dynamic Overload OFF time	Output shorted to GND	1800		ms	
TsDNThermal Shutdown Threshold160°C	TSDN	Thermal Shutdown Threshold		160		°C	
TsDN_HYSThermal Shutdown Hysteresis25°C	TSDN_HYS	Thermal Shutdown Hysteresis		25		°C	
Tone							
FTONE Input Tone Frequency Range 20 22 KHz	FTONE	Input Tone Frequency Range		20	22		KHz
VPP_TONE VLNB Output Tone Amplitude, ILOAD=50mA to 450mA, 620 650 680 mV	VPP_TONE	VLNB Output Tone Amplitude,	ILOAD=50mA to 450mA,	620	650	680	mV
peak to peak CLOAD=200nF		peak to peak CLOAD=200nF					



Duty_TONE	VLNB output Tone Duty	ILOAD=0mA to 450mA,		50		%
		CLOAD=570nF				
TRISE_TONE	VLNB output Tone Rising Time	ILOAD=0mA to 450mA,	5	7.5	10	μs
		CLOAD=570nF				
TFALL_TONE	VLNB output Tone Rising Time	ILOAD=0mA to 450mA,	5	7.5	10	μs
		CLOAD=570nF				
VTONE(H)	TONE High Logic Input		0.95			V
VTONE(L)	TONE Low Logic Input				0.55	V
IEMTMLKG	TONE Pin Input Leakage		-1		1	μA
	Current					
S18V						
VS18V(H)	Logic High Input		0.95			V
VS18V(L)	Logic Low Input				0.55	V
IS18V_LKG	Pin Input Leakage Current	Input=1.2V	-10		10	μA
ENABLE						
VEN_CLAMP_1	Internal Zener Diode Voltage	20µA< EN pin Sink Current <100µA		6.2	7.2	V
VEN_CLAMP_2	Internal Voltage Clamp	EN pin Sink Current < 5uA		1.3	1.6	V
IEN_PIN	EN PIN Maximum Input	Input =6.3V			100	μA
	Current					
VEN(H)	EN Logic High Input		0.95			V
VEN(L)	EN Logic Low Input				0.55	V
Boost DC/DC						
Freq_pwm	Bost DC/DC Switching	VEN=3.3V	0.8	1.0	1.2	MHz
	Frequency					
Max Duty_PMW	Boost Maximum Duty			93		%
TON_MIN_PWM	Boost Minimum On time		0		ns	
ILIM_PWM	Boost Current Limit		1.8			А

4





PIN FUNCTIONS

	PIN No.	Description
	INN8186	
NAME	SOP8EP	Details
VIN	1	Power Supply input
VLNB	2	Output voltage for the LNB
VSW	3	Boost converter output voltage sense, and internal LDO's input terminal
VCP	4	Charge Pump for LDO supply
LX	5	DC-DC converter switch node connection, connects to inductor
EN	6	When this pin is low, the output is disabled. Setting EN = 1 enables the output voltage
S18V	7	Output voltage selection pins. High for 19.3V output; Low for 14.3V output
TONE	8	Externally modulated DiSEqC tone signal input, like 22KHz signal, which is transferred
		symmetrically onto LNB pin.
Ground	9	Whole chip power ground
	(Exposed pad)	



1) Low Noise (Standard) Application (Noise< +/-40mV@300MHz BWL)



Notes:

- 1) Exposed pad has to be connected to GA and GP ground shortly;
- 2) C4 should be very close to VSW pin and GP pin, which can reduce noise largely
- 3) C1 should be very close to VIN pin
- 4) Co5 should be very close to VLNB pin
- 5) R1 (5.1Kohm, 1206) is only for no loading's 22KHz Tone waveform due to that Ds2 diode switches off sinking current into VLNB pin.



2) Optional Application with Less Drop Voltage



Notes:

- 1) Exposed pad has to be connected to GA and GP ground shortly;
- 2) C4 should be very close to VSW pin and GP pin, which can reduce noise largely
- 3) C1 should be very close to VIN pin
- 4) Co5 should be very close to VLNB pin



FUNCTION DESCRIPTION

The INN8186 single output LNB supply utilizes built-in DC/DC step-up converters, which operate from 9V to 14V and outputs the low noise voltage set by S18V pin, and accepts a tome modulated DiSEqC command and transfers it symmetrically to the output to meet DiSEqC 1.x protocol.

DiSEqC Encoding

The TONE accepts an externally modulated tone command and in turn modulates the VLNB symmetrically to meet the DiSEqC 1.x and with few more external components to meet DiSEqC 2.0 transmit protocol. Burst coding of the tone can be accomplished due to the fast response of the TONE pin.

Linear Regulator

The output linear regulator is designed to source 450mA continuous current and 500mA peak.

In order to minimize the power dissipation, the output voltage of the internal step-up converter is adjusted to allow the linear regulator to work at a minimum dropout of 1.2V typical (Load current =450mA) between the VSW and VOUT pin. The VSEN pin is capable of withstanding a back voltage of 24V.

When the device is put in the shutdown mode (EN = LOW), the PWM power block is disabled, a back diode need to be inserted to VLNB output to block reverse current if parallel with other LNB output.

When the regulator blocks are active (EN = HIGH), the output can be controlled by S18V pin to be 14.3V or 19.3V for remote controlling

Short and Over Load Protection

When the LDO current exceeds the preset overcurrent threshold set by means of a resistor from the ILIM pin to GND for a period of 45ms, the device enters a TON = 45ms/TOFF = 1800msroutine. The device returns to normal operation This IC is protected against overheating. When the junction temperature exceeds +160°C (typical), the step-up converter and the linear regulator are shut-off. When the junction is cooled down to +135°C (typical), normal operation is resumed.

Tone input (TONE pin)

Once EN is pulled high, after a 50ms delay before applying 22kHz/44kHz, 50% square pulse on TONE pin generates the DISEQ tone (+/-320mV) on the output VLNB.



LNB INTERNAL BLOCK DIAGRAM





METHOD OF 22KHz TONE MODULATION TO CONTROL LNB



DiSeqC Modulation Scheme

'0' TONE BURST (SATELLITE A)



Timing Diagram for 22KHz Tone Burst Control Signal



TYPICAL PERFORMANCE CURVES



Figure.1 22KHz Tone ON 13.3Vout with 100mA Loading



Figure.3 22KHz Tone Rising (7.5us) /Falling (7.5us) Edge



Figure.5 800ms Off/ 45ms ON when Output Shorted



Figure.2 22KHz Tone ON 13.3Vout with Transient Loading (100mA \rightarrow 400mA \rightarrow 100mA, slew rate 255mA/7.5us)



Figure.4 PWM Wave (DCM) with light loading









山が	Dimensions In Millimeters		Dimensions In Inches		
子付	Min	Max	Min	Max	
А	1. 350	1.750	0. 053	0.069	
A1	0. 050	0. 150	0. 004	0. 010	
A2	1.350	1.550	0. 053	0. 061	
b	0. 330	0. 510	0. 013	0. 020	
с	0. 170	0. 250	0.006	0. 010	
D	4. 700	5.100	0. 185	0. 200	
D1	3. 202	3. 402	0. 126	0. 134	
E	3.800	4.000	0. 150	0. 157	
E1	5.800	6.200	0. 228	0. 244	
E2	2. 313	2. 513	0. 091	0. 099	
е	1. 270 (BSC)		0. 050	(BSC)	
L	0. 400	1.270	0.016	0. 050	
θ	0 °	8 °	0 °	8 °	