8284

Data Sheet
27448.1

TWO-OUTPUT LNB SUPPLY AND CONTROL-VOLTAGE REGULATOR

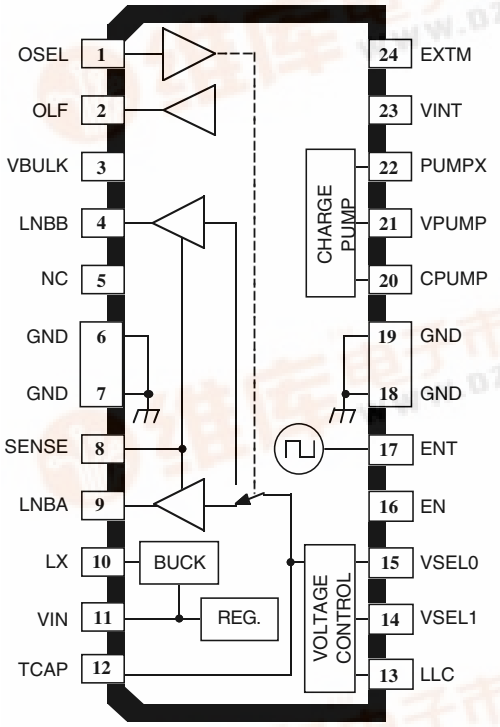
Intended for analog and digital satellite receivers, the low noise block converter regulator (LNBR) is a monolithic linear and switching voltage regulator designed to provide power and interface signals to the LNB downconverter via the coaxial cable. Because most satellite receivers have two antenna ports, the output voltage of the regulator is available at one of two logic-selectable output terminals (LNBA, LNBB). If the device is in stand-by mode (EN terminal LOW), both regulator outputs are disabled, allowing the antenna downconverters to be supplied and controlled by other satellite receivers sharing the same coaxial cable. Similar single-output devices, with a bypass function for slave operation in single-dish dual-receiver systems, are the A8283SB/SLB.

The regulator outputs are set to 12, 13, 18, or 20 V by the VSEL terminals. Additionally, it is possible to increase the selected voltage by 1 V to compensate for the voltage drop in the coaxial cable (LLC terminal HIGH).

The LNBR combines a tracking switching regulator and low-noise linear regulators. Logic inputs (VSEL0, VSEL1, and LLC) select the desired output voltage. A tracking current-mode buck converter provides the linear regulator input voltage that is set to the output voltage plus typically 0.8 V. This maintains constant voltage drop across the linear regulators while permitting adequate voltage range for tone injection.

The device is supplied in a 24-pin plastic DIP with batwing tabs (A8284SB), or a 24-lead SOIC power-tab package (A8284SLB). In both cases, the power tab is at ground potential and needs no electrical isolation.

A8284SLB



Dwg. PP-072-1A

Note that the A8284SB (dual in-line package) and A8284SLB (small-outline IC package) are electrically identical and share a common terminal number assignment.

FEATURES

- Complete Interface for Two LNBs Remote Supply and Control
- LNB Selection and Stand-By Function
- Built-In Tone Oscillator Factory Trimmed to 22 kHz, Facilitates DiSEqC™ (a trademark of EUTELSAT) Encoding
- Full Modulation With No Load
- Tracking Switch-Mode Power Converter for Lowest Dissipation
- Externally Adjustable Short-Circuit Protection
- LNB Short-Circuit Protection and Diagnostics
- Auxiliary Modulation Input
- Cable Length Compensation
- Internal Over-Temperature Protection

This device incorporates features that have patents pending.

ABSOLUTE MAXIMUM RATINGS

Supply Voltage, V_{IN} ..... **47 V**
Output Current, I_O .... **Internally Limited**
Logic Input Voltage Range,
V_I ..... **-0.5 V to +7 V**
Flag Output Voltage, V_{OLF} ..... **7 V**
Operating Temperature Range,
T_A ..... **-20°C to +85°C**
Storage Temperature Range,
T_S ..... **-40°C to +150°C**

Always order by complete part number, e.g., **A8284SLB**.

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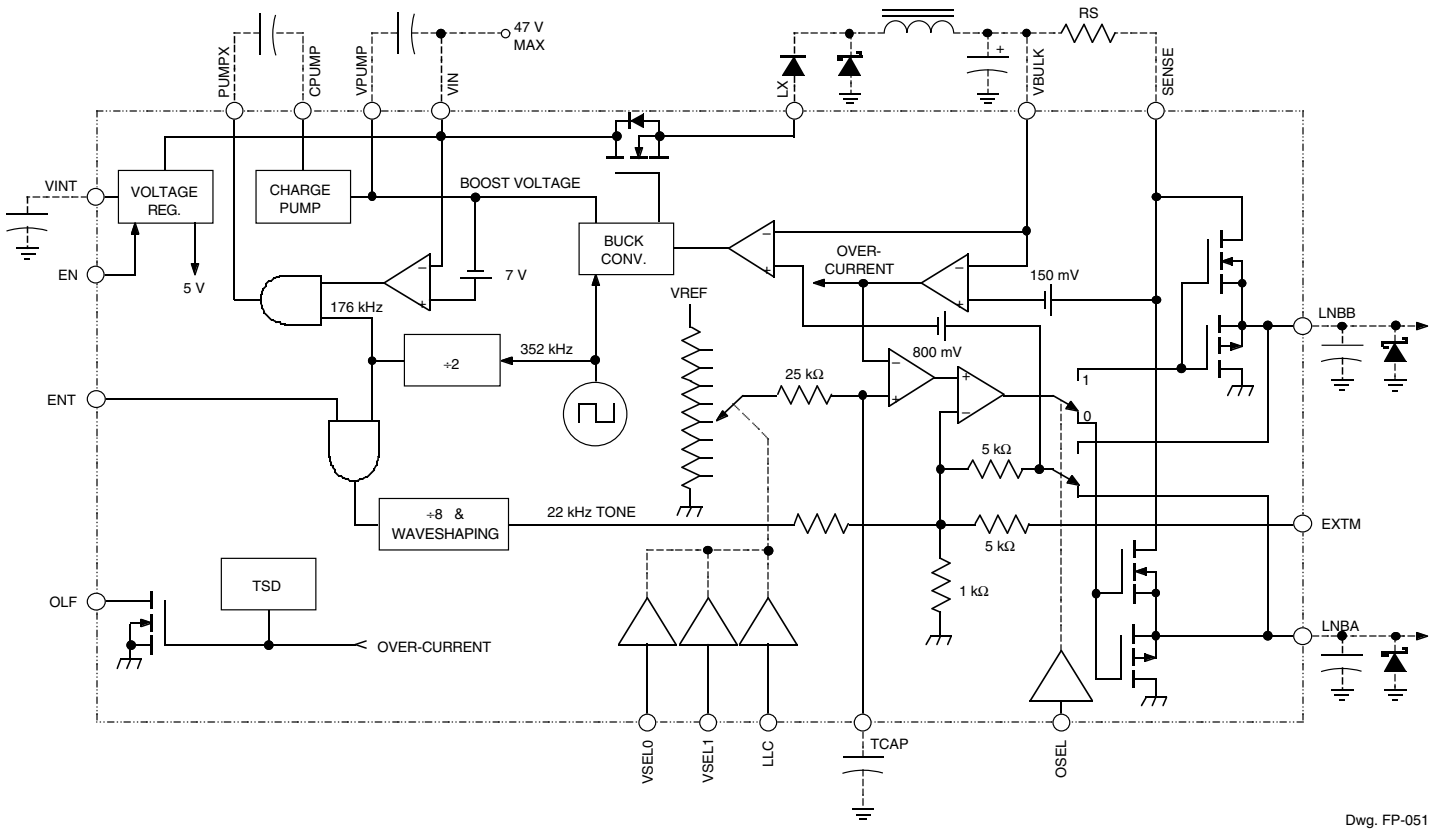
FUNCTIONAL BLOCK DIAGRAM



Dwg. FP-051

OSEL	VSEL0	VSEL1	LLC	$V_{LNBA(typ)}$	$V_{LNBB(typ)}$
L	L	L	L	13 V	Low
L	L	L	H	14 V	Low
L	L	H	L	18 V	Low
L	L	H	H	19 V	Low
L	H	L	L	12 V	Low
L	H	L	H	13 V	Low
L	H	H	L	20 V	Low
L	H	H	H	21 V	Low
H	L	L	L	Low	13 V
H	L	L	H	Low	14 V
H	L	H	L	Low	18 V
H	L	H	H	Low	19 V
H	H	L	L	Low	12 V
H	H	L	H	Low	13 V
H	H	H	L	Low	20 V
H	H	H	H	Low	21 V

Output Voltage Select Table

ELECTRICAL CHARACTERISTICS at T_A = 25°C, OSEL = H for LNBB, OSEL = L for LNBA (each output tested separately), ENT = L, EN = H, LLC = L, V_{IN} = 24 V, I_O = 50 mA (unless otherwise noted).

Characteristic	Symbol	Test Conditions	Limits			
			Min.	Typ.	Max.	Units
Supply Voltage	V_{IN}	I_O = 600 mA, VSEL0 = L, VSEL1 = L, LLC = L	—	3.3 + ΔV_{BUCK}	47	V
Output Voltage	V_O	I_O = 600 mA, VSEL0 = L, VSEL1 = L, LLC = L	12.5	13	13.5	V
		I_O = 600 mA, VSEL0 = L, VSEL1 = L, LLC = H	13.4	14	14.6	V
		I_O = 600 mA, VSEL0 = L, VSEL1 = H, LLC = L	17.3	18	18.7	V
		I_O = 600 mA, VSEL0 = L, VSEL1 = H, LLC = H	18.2	19	19.8	V
		I_O = 600 mA, VSEL0 = H, VSEL1 = L, LLC = L	11.5	12	12.5	V
		I_O = 600 mA, VSEL0 = H, VSEL1 = L, LLC = H	12.5	13	13.5	V
		I_O = 600 mA, VSEL0 = H, VSEL1 = H, LLC = L	19.2	20	20.8	V
		I_O = 600 mA, VSEL0 = H, VSEL1 = H, LLC = H	20.2	21	21.8	V
Line Regulation	ΔV_O	V_O = 13 V, V_I = 16 to 40 V	—	4.0	40	mV
		V_O = 18 V, V_I = 21 to 40 V	—	4.0	40	mV
Load Regulation	ΔV_O	V_O = 13 or 18 V, I_O = 50 to 600 mA	—	80	180	mV
Current-Limiting Threshold	$V_{OM(th)}$		125	135	145	mV
Tone Frequency	f_{tone}	ENT = H	20	22	24	kHz
Tone Amplitude	$V_{tone(PP)}$	ENT = H	550	680	800	mV
Tone Duty Cycle	dc_{tone}	ENT = H	40	50	60	%
Tone Rise or Fall Time	t_r, t_f	ENT = H	5.0	10	15	µs
External Modulation Gain	G_{mod}	$\Delta V_O/\Delta V_{mod}$, f = 10 Hz to 40 kHz	—	5.0	—	V/V
External Modulation Input Voltage	$V_{mod(PP)}$	AC coupling	—	—	160	mV
External Modulation Impedance	Z_{mod}	f = 10 Hz to 40 kHz	—	5.0	—	kΩ

continued next page ...

ELECTRICAL CHARACTERISTICS at T_A = 25°C, ENT = L, EN = H, LLC = L, V_{IN} = 24 V, I_{OUT} = 50 mA (unless otherwise noted).

Characteristic	Symbol	Test Conditions	Limits			
			Min.	Typ.	Max.	Units
Overload Flag Logic Low	V_{OL}	I_{OL} = 8 mA	—	0.28	—	V
Overload Flag Leakage Current	I_{OZ}	V_{OH} = 5.5 V	—	<1.0	—	µA
Logic Input Voltage	V_{IL}		—	—	0.8	V
	V_{IH}		2.0	—	—	V
Logic Input Current	I_{IH}	V_{IH} = 5 V	—	<1.0	—	µA
Supply Current	I_{IN}	Outputs disabled (EN = L)	—	0.5	—	mA
		ENT = H, I_O = 600 mA, V_O = 13 V	—	382	—	mA
Thermal Shutdown Temp.	T_J		—	165	—	°C
Linear Regulator Voltage Drop	ΔV_{BUCK}	$V_{BULK} - V_O$	—	0.8	—	V
Switching Frequency	f_O	16 • f_{tone}	320	352	384	kHz

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FUNCTIONAL DESCRIPTION

The ENT (Tone Enable) terminal activates the internal tone signal, modulating the dc output with a ±0.3 V, 22 kHz symmetrical waveform. The internal oscillator is factory trimmed to provide a tone of 22 kHz ± 2 kHz. No further adjustment is required. The internal oscillator operates the buck converter at 16 times the tone frequency.

Burst coding of the 22 kHz tone can be accomplished, due to the fast response of the ENT input and rapid tone response. This allows implementation of the DiSEqC™ protocols.

To improve design flexibility and to allow implementation of proposed LNB remote control standards, an analog modulation input terminal is available (EXTM). An appropriate dc blocking capacitor must be used to couple the modulating signal source to the EXTM terminal. If external modulation is not used, the EXTM terminal can be left open.

The output linear regulators will sink and source current. This feature allows full modulation capability into capacitive loads as high as 0.25 µF.

The programmed output voltage rise and fall times can be set by an internal 25 kΩ resistor and an external capacitor located on the TCAP terminal. Although any value of capacitor is permitted, practical values are typically 0.001 µF to 0.02 µF. This feature only affects the turn on and programmed voltage rise and fall times. Modulation is unaffected by the choice of TCAP. This terminal can be left open if voltage rise and fall time control is not required.

Two terminals are dedicated to the over-current protection/monitoring: SENSE and OLF. The LNB output is current limited. The short-circuit protection threshold is set by the value of an external resistor, R_S, between terminals 3 and 8. $R_S = V_{OM(th)}/I_{OM}$ where $V_{OM(th)}$ is the current-limiting threshold voltage and I_{OM} is the desired current limit value. The minimum recommended value for R_S is 0.17 Ω.

In operation, the short-circuit protection produces current fold-back at the input due to the tracking converter. If the output is shorted the linear regulator will limit the output current to I_{OM}. The tracking converter will maintain a constant voltage drop of 0.8 V across the linear regulator. This condition results in typically 550 mW dissipation (I_{OM} • 0.8 V). Short-circuit or thermal shutdown activation will cause the OLF terminal, an open-drain diagnostic output flag, to go LOW.

Thermal resistance:
DIP — $R_{\theta JA}$ = 40°C/W, $R_{\theta JT}$ = 6°C/W,
SOIC — $R_{\theta JA}$ = 55°C/W, $R_{\theta JT}$ = 6°C/W.
The device junction temperature should be kept below 150°C. Thermal shut-down circuitry turns off the device if junction temperature exceeds +165°C typically.

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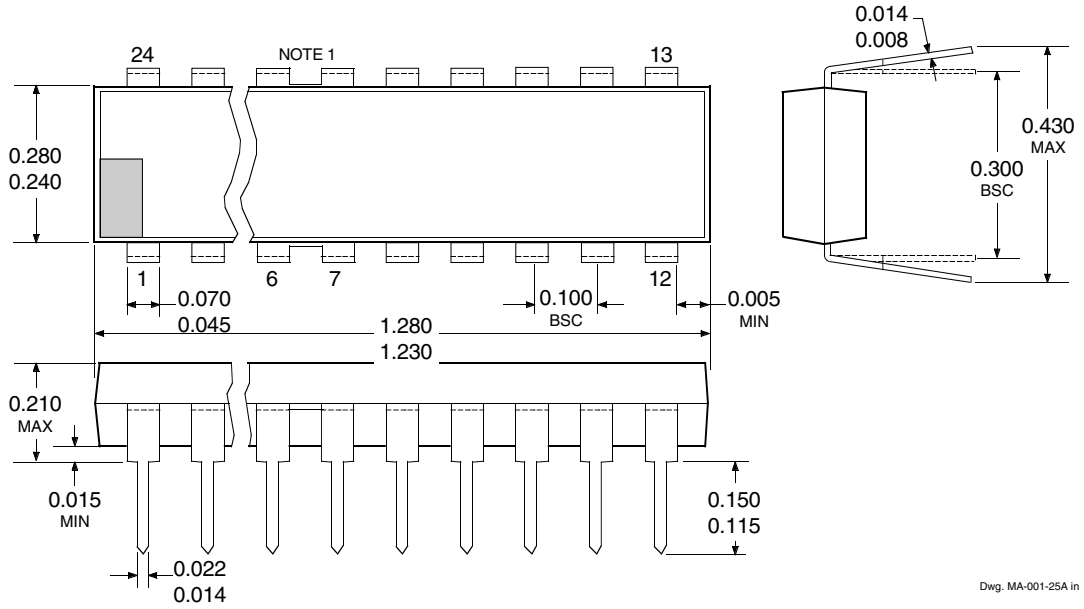
Terminal Configuration

Symbol	Terminal	Function
OSEL	1	Logic input: selects between LNBA (when low) and LNBB (when high)
OLF	2	Overload flag output: low when $I_O > I_{OM}$ or $T_J > 165°C$, high when $I_O < I_{OM}$ and $T_J < 130°C$
VBULK	3	Tracking supply voltage to linear regulators
LNBB	4	Output voltage to LNBB
NC	5	No (internal) connection
GND	6, 7	Ground
SENSE	8	Current limit setup resistor
LNBA	9	Output voltage to LNBA
LX	10	Inductor drive point
VIN	11	Supply input voltage (minimum, VLNB + 2.5 V)
TCAP	12	Capacitor for setting the rise and fall time of the outputs
LLC	13	Logic input: when high, increases output voltage by 1 V for line length compensation
VSEL1	14	Logic input: output voltage select
VSEL0	15	Logic input: output voltage select
EN	16	Logic input: when high, enables device (LNB on)
ENT	17	Logic input: when high, enables internal 22 kHz modulation
GND	18, 19	Ground
CPUMP	20	High side of charge-pump capacitor
VPUMP	21	Gate supply voltage for high-side drivers
PUMPX	22	Charge-pump drive
VINT	23	Bypass capacitor for internal voltage reference
EXTM	24	External modulation input

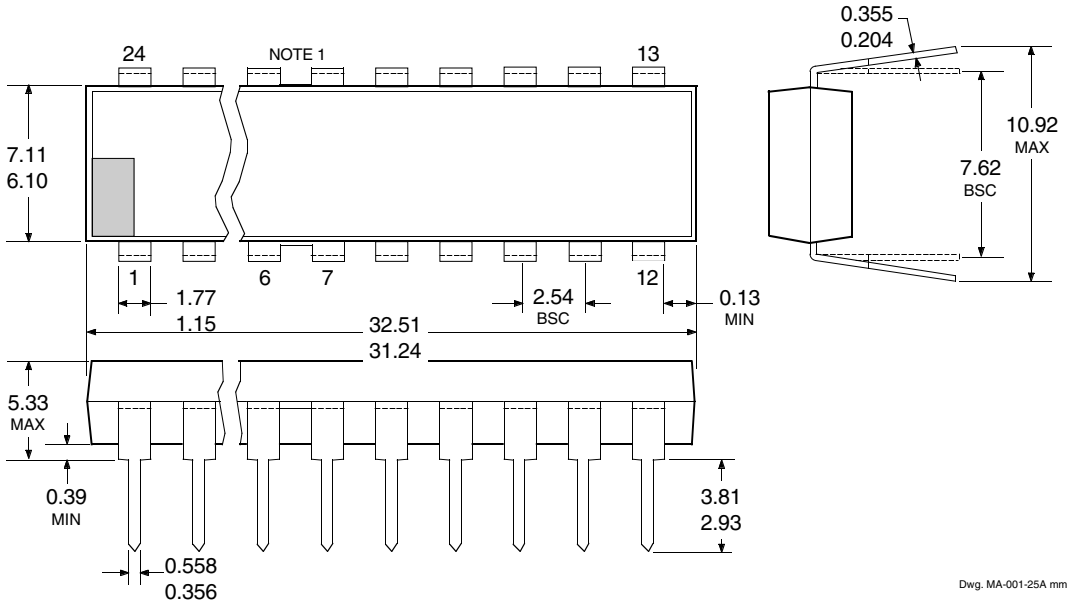
A8284SB

Dimensions in Inches
(controlling dimensions)



Dwg. MA-001-25A in

Dimensions in Millimeters
(for reference only)



Dwg. MA-001-25A mm

NOTES: 1. Webbed lead frame. Leads 6, 7, 18, and 19 are internally one piece.
2. Exact body and lead configuration at vendor's option within limits shown.
3. Lead spacing tolerance is non-cumulative
4. Lead thickness is measured at seating plane or below.

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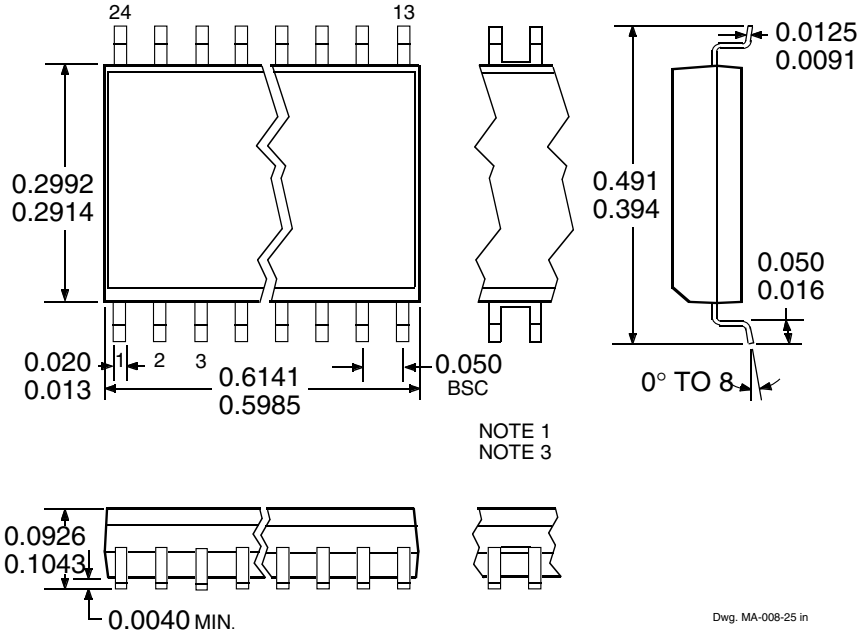
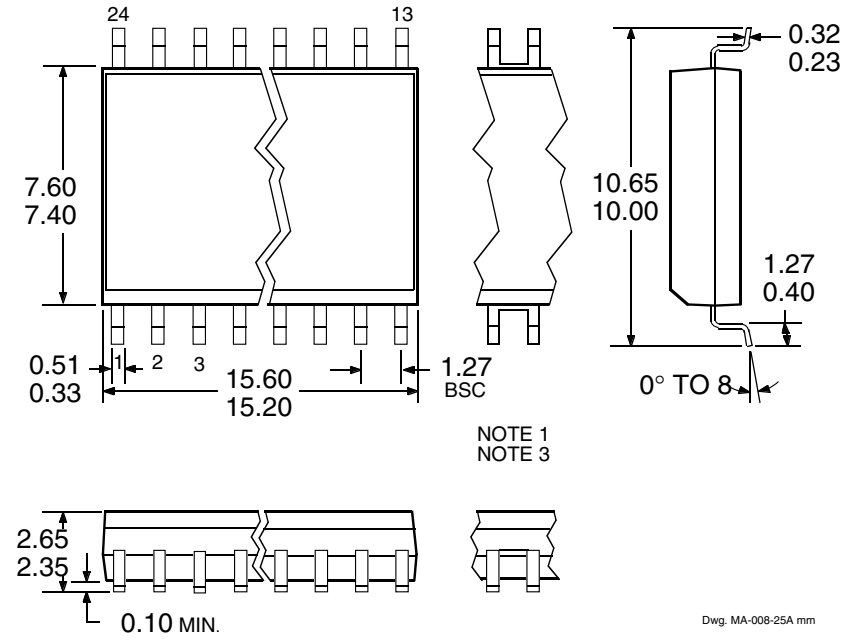
A8284SLB

Dimensions in Inches
(for reference only)



Dwg. MA-008-25 in

Dimensions in Millimeters
(controlling dimensions)



Dwg. MA-008-25A mm

NOTES: 1. Exact body and lead configuration at vendor's option within limits shown.
2. Lead spacing tolerance is non-cumulative
3. Webbed lead frame. Leads 6, 7, 18, and 19 are internally one piece.