Voltage Regulator

VRG8687/88

Dual 3A LDO Adjustable Positive Voltage Regulators

Released Datasheet

Cobham.com/HiRel

March 24, 2016

The most important thing we build is trust

FEATURES

- ❑ Manufactured using LINEAR TECHNOLOGY Space Qualified RH1084 die
- ❑ Radiation performance
  - Total dose ≥ 100 krad(Si),
    Dose rate = 50-300 rad(Si)/s
- ❑ Two-Independent voltage regulators
- ❑ Thermal shutdown
- ❑ Output voltage adjustable: 1.25V to 23V
- ❑ Dropout voltage: 1.80V at 3.0Amps
- ❑ 3-Terminal
- ❑ Output current: 3.0Amps
- ❑ Voltage reference: 1.25V +2%, -3.2%
- ❑ Load regulation: 0.35% max
- ❑ Line regulation: 0.25% max
- ❑ Ripple rejection: >60dB
- ❑ Packaging – Hermetic metal
  - Thru-hole or Surface mount
  - 8 Leads, .755"L x .415"W x .200"Ht
  - Power package
  - Weight - 6 gm max
- ❑ Designed for aerospace and high reliability space applications

❑ **Radiation Hardness Assurance Plan: DLA Certified to MIL-PRF-38534, Appendix G.**

DESCRIPTION

The VRG8687/8688 consists of two Positive Adjustable (RH1084) LDO voltage regulators each capable of supplying 3.0Amps over the output voltage range as defined under recommended operating conditions. The VRG8687/8688 offers excellent line and load regulation specifications and ripple rejection. There is full electrical isolation between the regulators and each regulator to the package.

The VRG8687/8688 serves a wide variety of applications including SCSI-2 Active Terminator, High Efficiency Linear Regulators, Post Regulators for Switching Supplies, Constant Current Regulators, Battery Chargers and Microprocessor Supply.

The VRG8687/8688 has been specifically designed to meet exposure to radiation environments. The VRG8687 is configured for a Thru-Hole 8 lead metal power package and the VRG8688 is configured for a Surface Mount 8 lead metal power package. It is guaranteed operational from -55°C to +125°C. Available screened in accordance with MIL-PRF-38534, the VRG8687/8688 is ideal for demanding military and space applications.

Dropout (VIN - VOUT) decreases at lower load currents for both regulators.

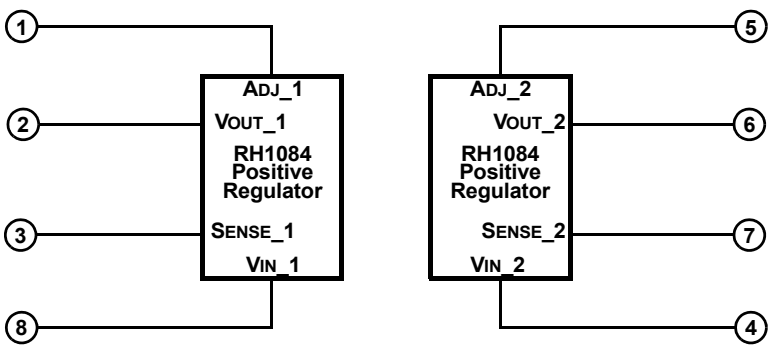


FIGURE 1 – BLOCK DIAGRAM / SCHEMATIC

ABSOLUTE MAXIMUM RATINGS

Parameter	Rating	Units
Input Voltage	+25	VDC
Input Output Differential	25	VDC
Load Current, maximum	6.0	A
Output Voltage	+25	VDC
ESD (MIL-STD-883, M3015, Class 2)	2000 to 3999	V
Operating Junction Temperature Range	-55 to +150	°C
Storage Temperature Range	-65 to +150	°C
Thermal Resistance, Junction to case Θ_{JC}	5	°C/W
Lead temperature (soldering 10 Sec)	300	°C

NOTICE: Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress rating only; functional operation beyond the "Operation Conditions" is not recommended and extended exposure beyond the "Operation Conditions" may effect device reliability.

RECOMMENDED OPERATING CONDITIONS

Parameter	Range	Units
Output Voltage Range	1.25 to 23.00	VDC
Input Output Differential 3/	1.8 to 24.0	VDC
Case Operating Temperature Range	-55 to +125	°C

ELECTRICAL PERFORMANCE CHARACTERISTICS 1/

UNLESS OTHERWISE SPECIFIED: $-55°C \le T_C \le +125°C$

Parameter	Symbol	Conditions ($P \le P_{MAX}$)	Min	Max	Units
Reference Voltage 3/, 2/	V_{REF}	$1.5V \le (V_{IN} - V_{OUT}) \le 15V$, $10mA \le I_{OUT} \le 3.0A$	1.210	1.275	V
Line Regulation 3/, 2/	$\frac{\Delta V_{OUT}}{\Delta V_{IN}}$	I_{LOAD} = 10mA, $1.5V \le (V_{IN} - V_{OUT}) \le 15V$	-	0.25	%
Load Regulation 3/, 2/	$\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$	$10mA \le I_{OUT} \le 3.0A$, $(V_{IN} - V_{OUT})$ = 3V	-	0.35	%
Dropout Voltage 4/, 2/	V_{DROP_1}	ΔV_{REF} = 1%, I_{OUT} = 5.0A	-	1.8	V
Dropout Voltage	V_{DROP_2}	ΔV_{REF} = 1%, I_{OUT} = 3.0A	-	1.4	V
Adjust Pin Current 2/	-		-	120	µA
Adjust Pin Current Change 2/	-	10 mA $\le I_{OUT} \le$ 3.0A, $1.5V \le (V_{IN} - V_{OUT}) \le 15V$	-	5	µA
Minimum Load Current 5/, 2/	I_{MIN}	$(V_{IN} - V_{OUT})$ = 25V	-	10	mA
Current Limit 2/	I_{CL}	$(V_{IN} - V_{OUT})$ = 5V	5.25	-	A
Ripple Rejection 3/	-	I_{OUT} = 0.5A, $(V_{IN} - V_{OUT})$ = 3V, f = 120Hz, $C_{ADJ} = C_{OUT}$ = 25µF	60	-	dB
Thermal Regulation	-	30ms pulse, T_C = +25°C	-	0.04	%/W

Notes:

1/ The manufacturer's output current rating for the RH1084MK positive regulator integrated circuit is 5.0 Amps. For Compliance with the Current Density specifictation of MIL-STD-883 Rev. C, the electrical performance characteristics are specified at an output current of 3.0 Amps.

2/ Specification derated to reflect total dose exposure to 100 krad(Si) at +25°C.

3/ Line and load regulation are guaranteed up to the maximum power dissipation of 15W per device. Power dissipation is determined by the input/output differential voltage and the output current. Guaranteed maximum power dissipation will not be available over the full input/output voltage range.

4/ Dropout voltage is specified over the full output current range of the device.

5/ Not tested. Shall be guaranteed by design, characterization, or correlation to other tested parameters.

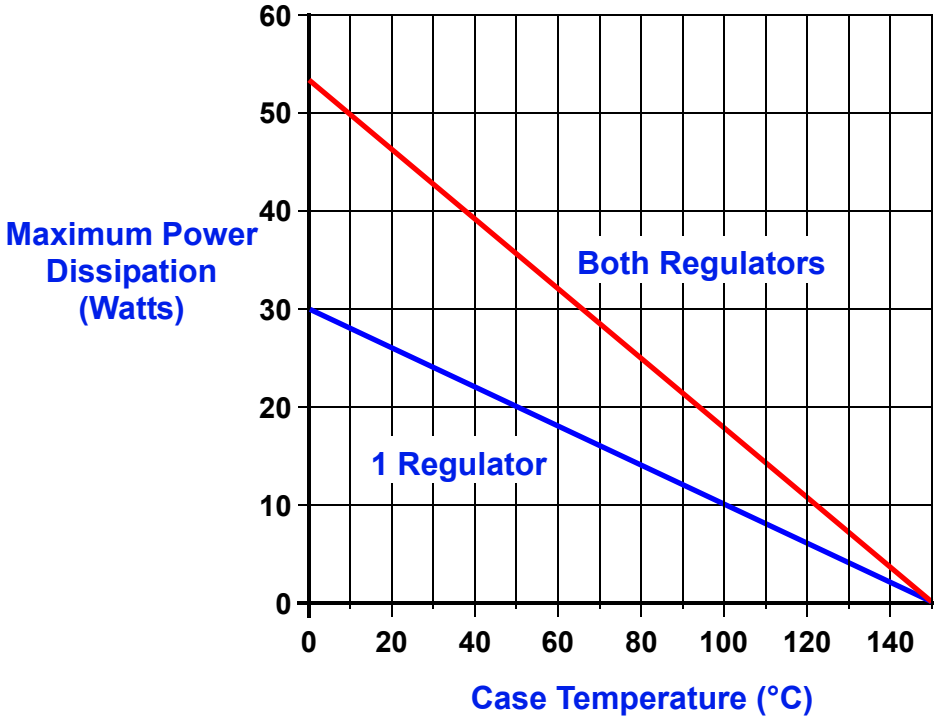


FIGURE 2 – MAXIMUM POWER vs CASE TEMPERATURE

The maximum Power dissipation is limited by the thermal shutdown function of each regulator chip in the VG8687/8688. The graph above represents the achievable power before the chip shuts down. The first line in the graph represents the maximum power dissipation of the VG8687/8688 with one regulator on (the other off) and the other line represents both regulators on dissipating equal power. If both regulators are on and one regulator is dissipating more power that the other, the maximum power dissipation of the VG8687/8688 will fall between the two lines. This graph is based on the maximum junction temperature of 150°C and a thermal resistance (Θ_{JC}) of 5°C/W.

See Note 1/ on page 2

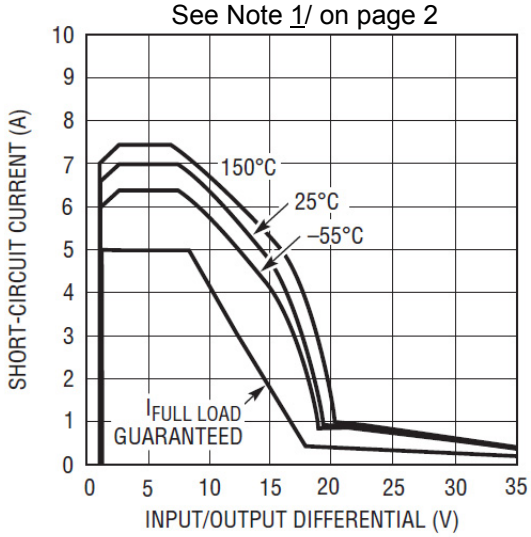


FIGURE 3 – RH1084 SHORT CIRCUIT CURRENT

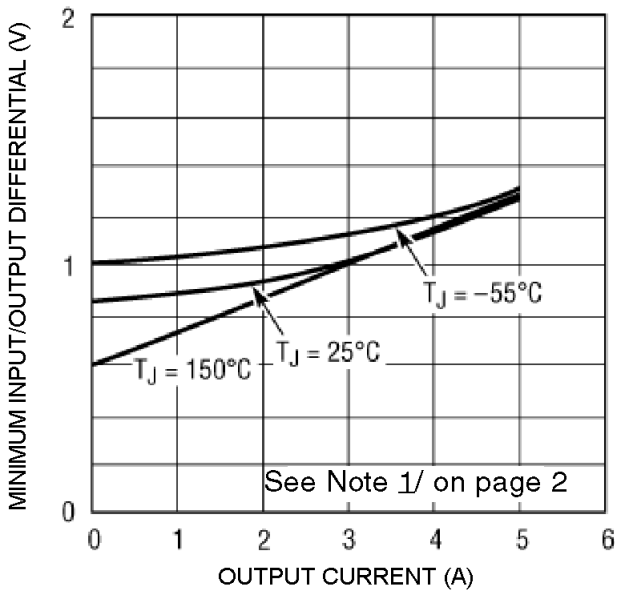
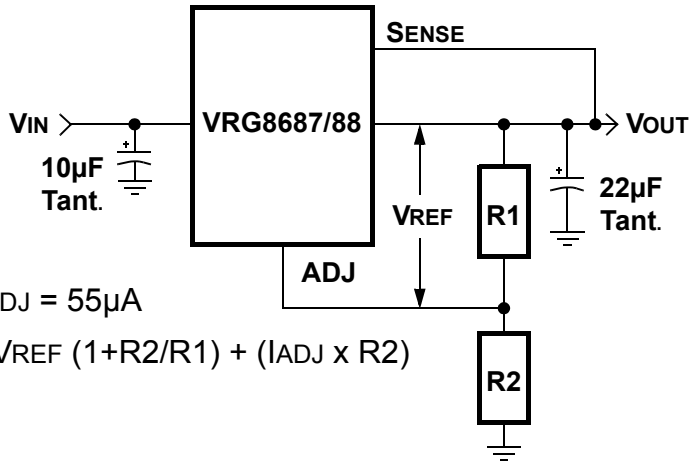


FIGURE 4 – RH1084 DROPOUT VOLTAGE TYPICAL CURVE



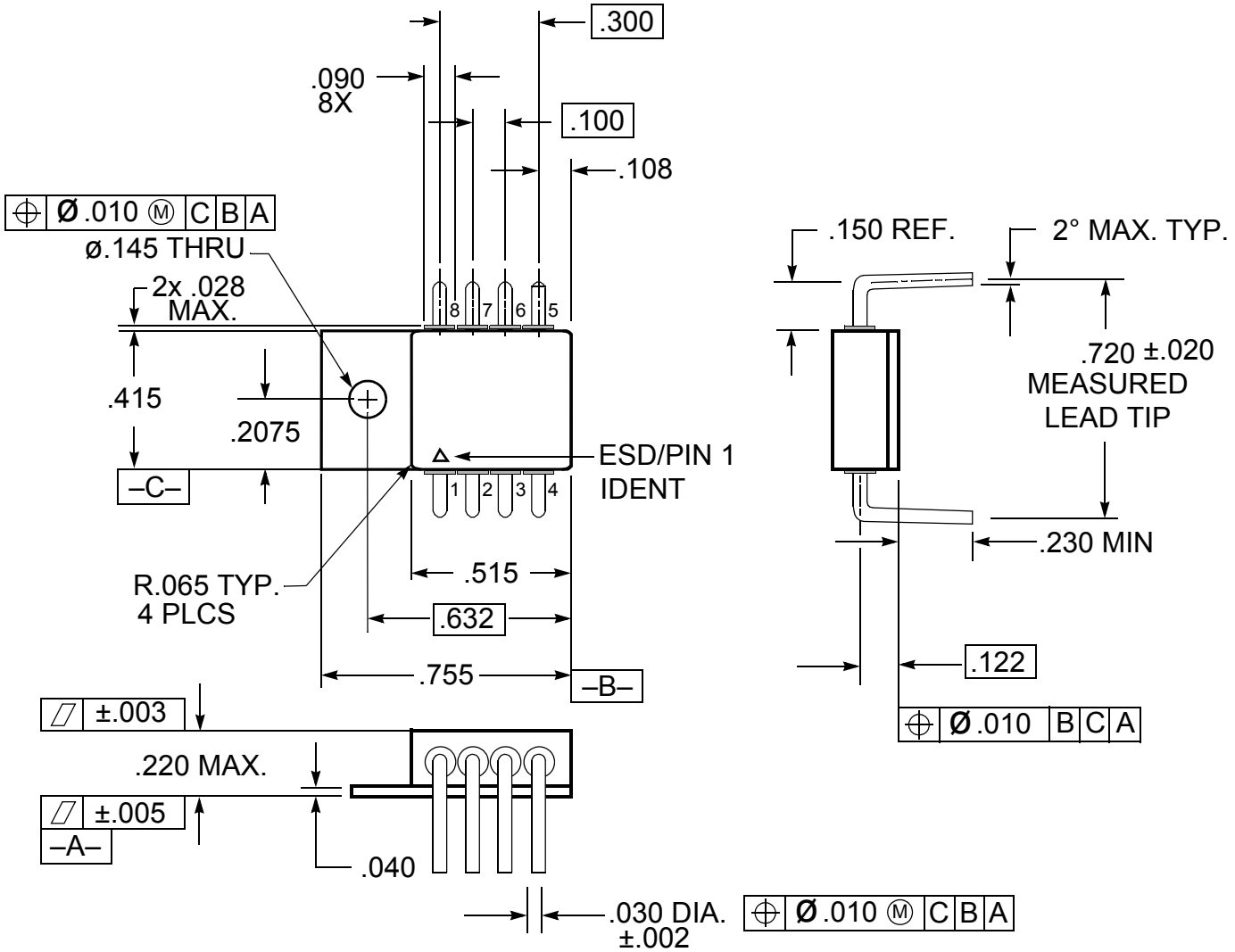
V_{REF} = 1.25V, I_{ADJ} = 55µA

+Reg = $V_{OUT} = V_{REF}(1+R2/R1) + (I_{ADJ} \times R2)$

FIGURE 5 – BASIC RH1084 ADJUSTABLE REGULATOR APPLICATION

TABLE I – PIN NUMBERS vs FUNCTION

PIN	FUNCTION
1	ADJ_1
2	VOUT_1
3	SENSE_1
4	VIN_2
5	ADJ_2
6	VOUT_2
7	SENSE_2
8	VIN_1

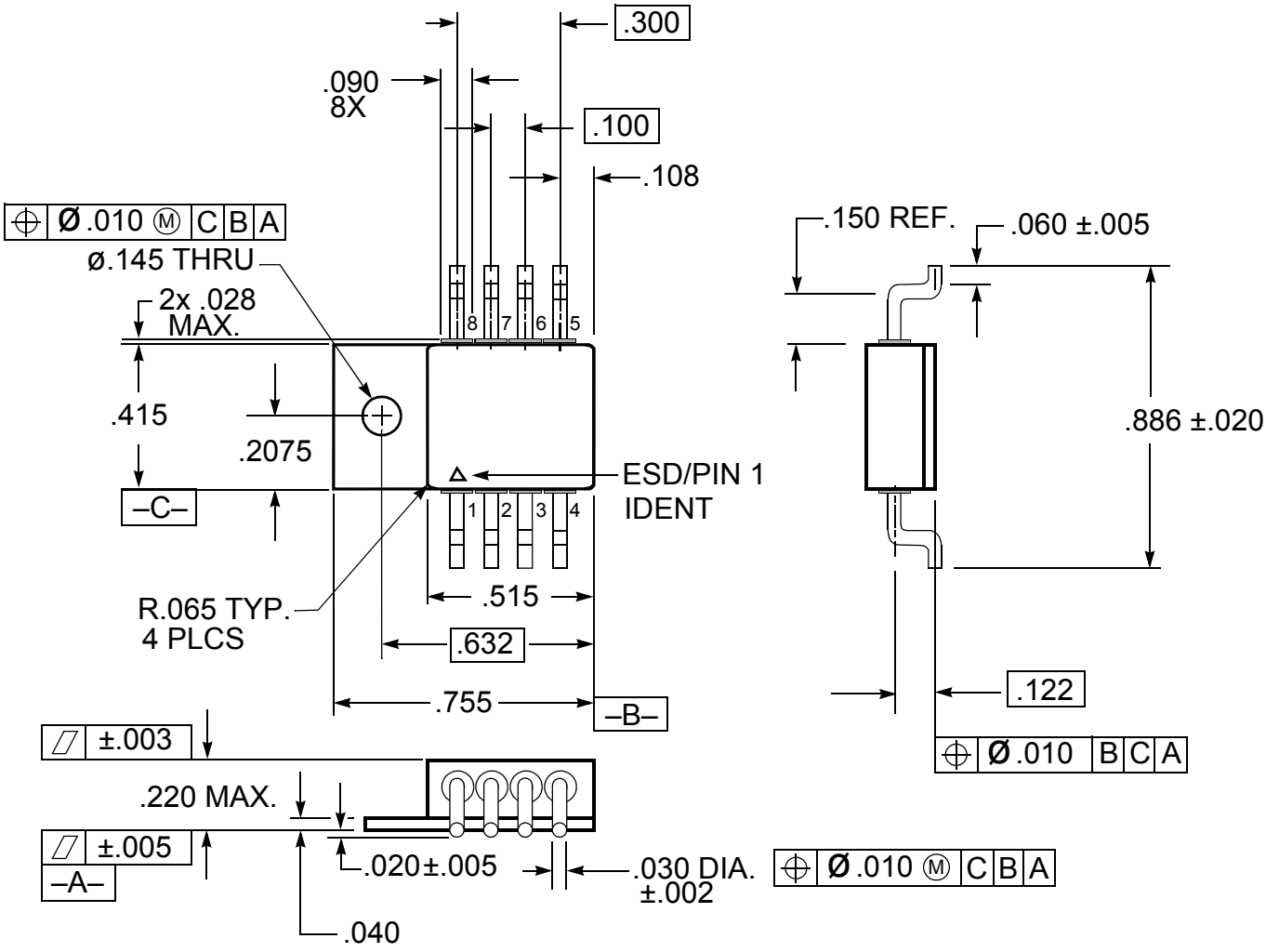


Notes:
1. Dimension Tolerance: ±.005 inches
2. Package contains BeO substrate
3. Case electrically isolated

FIGURE 5 – VRG8687 PACKAGE OUTLINE — THRU-HOLE POWER PACKAGE

TABLE II – PIN NUMBERS vs FUNCTION

PIN	FUNCTION
1	ADJ_1
2	VOUT_1
3	SENSE_1
4	VIN_2
5	ADJ_2
6	VOUT_2
7	SENSE_2
8	VIN_1



Notes:
1. Dimension Tolerance: ±.005 inches
2. Package contains BeO substrate
3. Case electrically isolated

FIGURE 6 – VRG8688 PACKAGE OUTLINE — SURFACE MOUNT POWER PACKAGE

ORDERING INFORMATION

Model	DLA SMD #	Screening	Package
VRG8687-7	-	Commercial Flow, +25°C testing only	8 Lead Thru-Hole Power Pkg
VRG8687-201-1S	5962-1021302KUC	In accordance with DLA SMD	
VRG8687-201-2S	5962-1021302KUA		
VRG8687-901-1S	5962R1021302KUC	In accordance with DLA Certified RHA Program Plan to RHA Level "R", 100 krad(Si)	
VRG8687-901-2S	5962R1021302KUA		
VRG8688-7	-	Commercial Flow, +25°C testing only	8 Lead Surface Mount Power Pkg
VRG8688-201-1S	5962-1021302KZC	In accordance with DLA SMD	
VRG8688-201-2S	5962-1021302KZA		
VRG8688-901-1S	5962R1021302KZC	In accordance with DLA Certified RHA Program Plan to RHA Level "R", 100 krad(Si)	
VRG8688-901-2S	5962R1021302KZA		

REVISION HISTORY

Date	Revision	Change Description
03/24/2016	D	Import into Cobham format

Datasheet Definition

Advanced Datasheet - Product In Development

Preliminary Datasheet - Shipping Prototype

Datasheet - Shipping QML & Reduced Hi-Rel

For detailed performance characteristic curves, applications information and typical applications, see the latest LINEAR TECHNOLOGY datasheet for their RH1084, which is available on-line at www.linear.com.

EXPORT CONTROL:

This product is controlled for export under the Export Administration Regulations (EAR), 15 CFR Parts 730-774.
A license from the Department of Commerce may be required prior to the export of this product from the United States.

Cobham Semiconductor Solutions
35 S. Service Road
Plainview, NY 11803

E: info-ams@cobham.com
T: 800 645 8862

COBHAM