Voltage Regulator

VRG8697/98

Dual 2.5A ULDO Adjustable Positive Voltage Regulators

Released Datasheet

Cobham.com/HiRel

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The most important thing we build is trust

FEATURES

- Manufactured using LINEAR TECHNOLOGY Space Qualified RH3083 die
- Radiation performance
  - Total dose: 100 krad(Si), Dose rate = 50-300 rad(Si)/s
  - ELDRS: 50 krad(Si), Dose rate ≤ 0.01 rad(Si)/s
- Two-Independent voltage regulators
- Current Limit with Foldback
- Over-temperature protection
- Input voltage range: 1.0V to 23V
- Output voltage adjustable: 0V to 22V
- Outputs may be paralleled for higher current
- Post Radiated Dropout voltage, $V_{CONTROL} \geq 2.0V$:
  - 0.75V @ 2.5Amps
  - 0.28V @ 1.0Amps
- Output current: 2.5Amps
- Packaging – Hermetic Meter Power Package
  - Thru-hole or Surface mount
  - 8 Leads, .755"L x .415"W x .200"Ht
  - 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 VRG8697/8698 consists of two Positive Adjustable (RH3083) ULDO voltage regulators each capable of supplying 2.5Amps over the output voltage range as defined under recommended operating conditions. The VRG8697/8698 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 VRG8697/8698 has been specifically designed to meet exposure to radiation environments. The VRG8697 is configured for a Thru-Hole 8 lead metal power package and the VRG8698 is configured for a Surface Mount 8 lead metal power package. It is guaranteed operational with a case operating temperature from -55°C to +125°C. Available screened in accordance with MIL-PRF-38534, the VRG8697/8698 is ideal for demanding military and space applications.

Dropout (V_{IN} - V_{OUT}) decreases at lower load currents for both regulators.

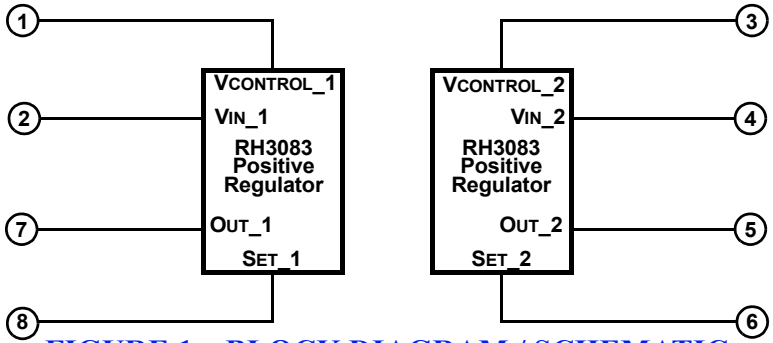


FIGURE 1 – BLOCK DIAGRAM / SCHEMATIC

ABSOLUTE MAXIMUM RATINGS

Parameter (Voltage is Relative to V_{OUT})	Rating	Units
Input Voltage (No Overload or Short Circuit)	+23	V_{DC}
$V_{CONTROL}$	+28	V_{DC}
Output Short Circuit Duration	Indefinite	-
Lead temperature (soldering 10 Sec)	300	°C
Input Output Differential	18	V_{DC}
ESD 1/	2,000 - 3,999	V
Operating Junction Temperature Range	-55 to +150	°C
Storage Temperature Range	-65 to +150	°C
Thermal Resistance (Junction to Case) Θ_{JC}	4	°C/W

1/ Meets ESD testing per MIL-STD-883, method 3015, Class 2.
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	0 to 22	V_{DC}
Input Output Differential	0.5 to 18	V_{DC}
Case Operating Temperature Range	-55 to +125	°C
Input Voltage (Voltages are Relative to V_{OUT})	1 to 23	V
$V_{CONTROL}$ (Voltages are Relative to V_{OUT})	1.6 to 28	V

ELECTRICAL PERFORMANCE CHARACTERISTICS

Unless otherwise specified: -55°C ≤ Tc ≤ +125°C.

Parameter	Symbol	Conditions ($P \leq P_{MAX}$)	Min	Max	Units
Set Pin Current	I_{REF_1}	1.0mA ≤ I_{LOAD} ≤ 2.5A, V_{IN} ≥ 2V, $V_{CONTROL}$ ≥ 3V	49.0	51.5	µA
Set Pin Current 1/	I_{REF_2}	V_{IN} = 2V, $V_{CONTROL}$ = 3V, I_{LOAD} = 1mA, T_C = 25°C	49	51	µA
Output Offset Voltage (V_{OUT} - V_{SET}) 1/	V_{OS}	V_{IN} = 2V, $V_{CONTROL}$ = 3V, I_{LOAD} = 1mA,	-6.0	6.0	mV
Line Regulation 1/	ΔV_{OS}	1V ≤ V_{IN} ≤ 23V, 2V ≤ $V_{CONTROL}$ ≤ 25V, I_{LOAD} = 1mA, T_C = +25°C	-0.07	0.07	mV/V
Load Regulation 1/	ΔV_{OS}	(V_{IN} - V_{OUT}) = 3V, I_{LOAD} = 5mA to 2.5A, T_C = 25°C	-10.0	10.0	mV
$V_{CONTROL}$ Dropout Voltage 2/	V_{CDROP}	I_{LOAD} = 2.5A	-	1.65	V
		I_{LOAD} = 1.0A 1/	-	1.60	
V_{IN} Dropout Voltage 2/	V_{INDROP}	I_{LOAD} = 2.5A	-	0.75	V
		I_{LOAD} = 1.0A 1/	-	0.28	
Current Limit 3/	I_{MAX}	V_{IN} = $V_{CONTROL}$ = +5V, V_{SET} = 0V, V_{OUT} = +0.4V	2.6	-	A
Minimum Load Current 1/ 4/	I_{MIN}	$V_{CONTROL}$ = 25V, V_{IN} = 23V	-	1.0	mA
Ripple Rejection	-	I_{LOAD} = 0.2A, (V_{IN} - V_{OUT}) = 3V, f = 120Hz, C_{OUT} = 10µF, C_{SET} = 0.1µF	60	-	dB

Notes:
1/ Specification derated to reflect Total Dose exposure to 100 krad(Si) @+25°C.
2/ Dropout results from either minimum control voltage, $V_{CONTROL}$, or minimum input voltage, V_{IN}, both specified with respect to V_{OUT}. These specifications represent the minimum input-to-output differential voltage required to maintain regulation.
3/ Pulsed @ <10% duty cycle @ +25°C for characterization only.
4/ Not tested. Shall be guaranteed to the specified limits.

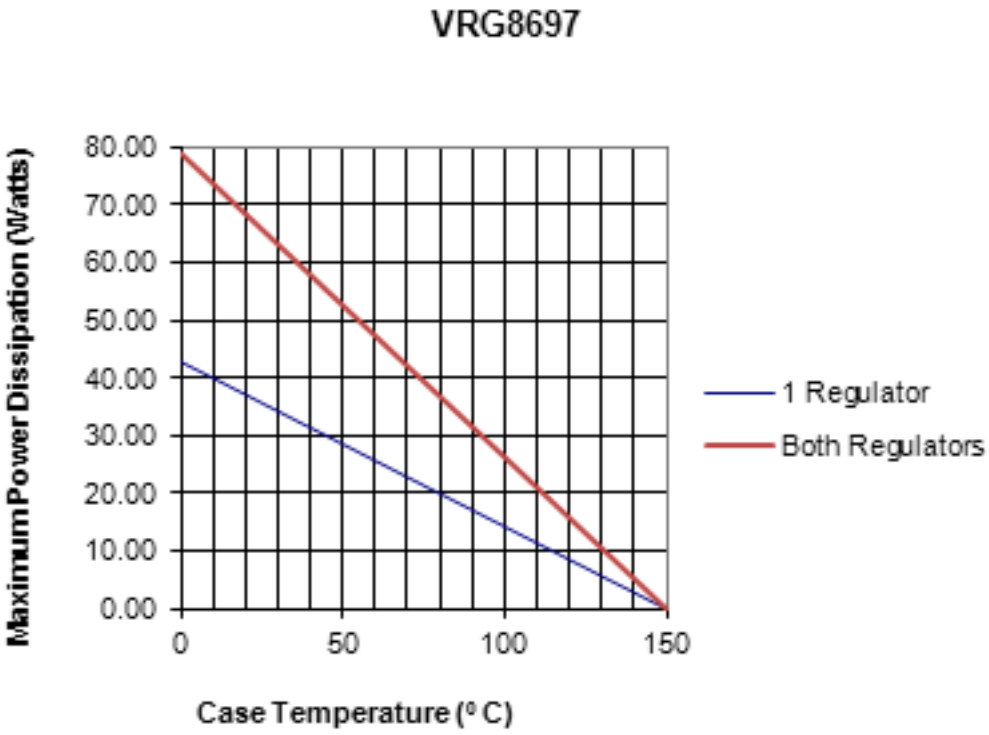


FIGURE 2 – MAXIMUM POWER vs CASE TEMPERATURE

The maximum Power dissipation is limited by the thermal shutdown function of each regulator chip in the VRG8697/8698. 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 VRG8697/8698 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 than the other, the maximum power dissipating of the VRG8697/8698 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 4°C/W.

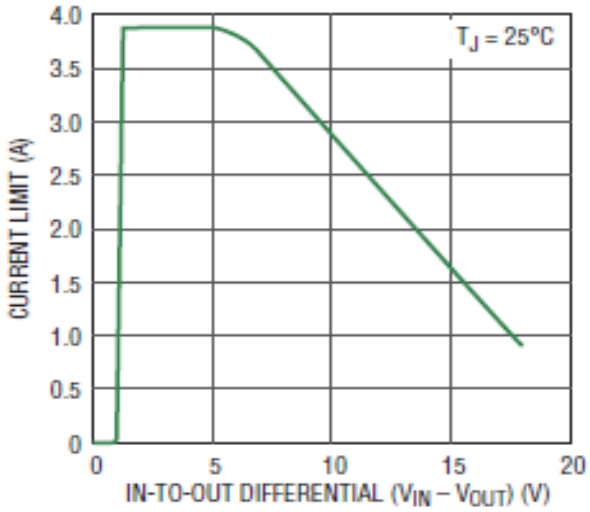


FIGURE 3 – RH3083 TYPICAL CURRENT LIMIT

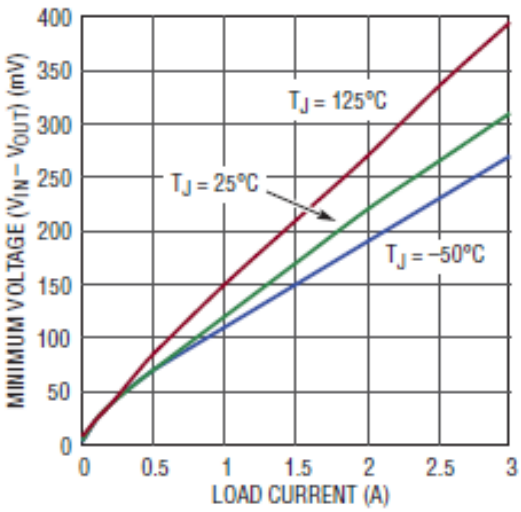


FIGURE 4 – RH3083 TYPICAL DROPOUT VOLTAGE CURVE ($V_{CONTROL}$ ≥ 1.65V)

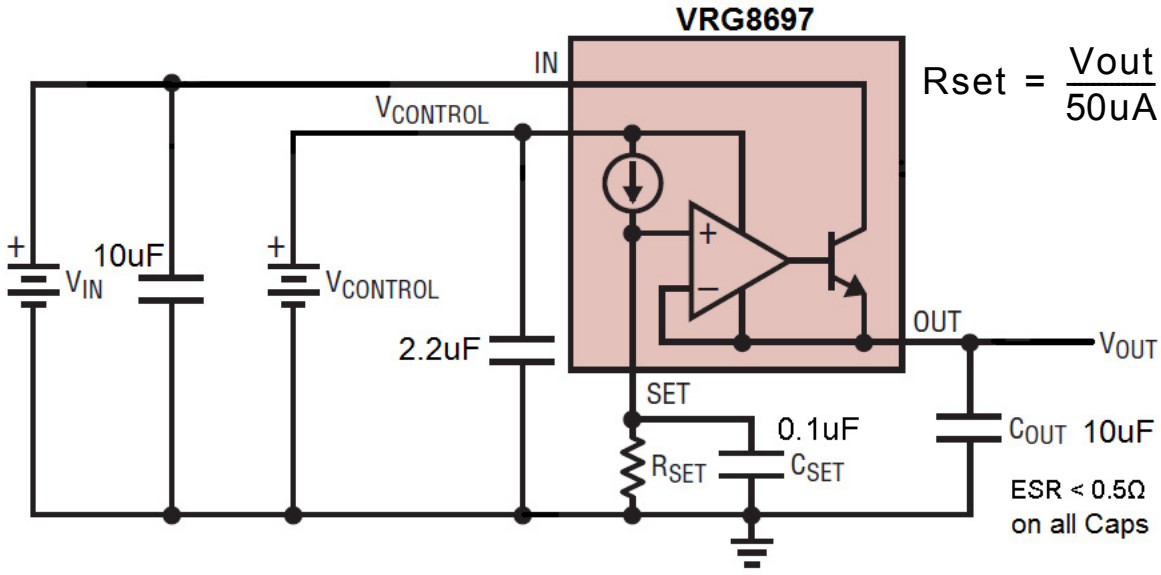
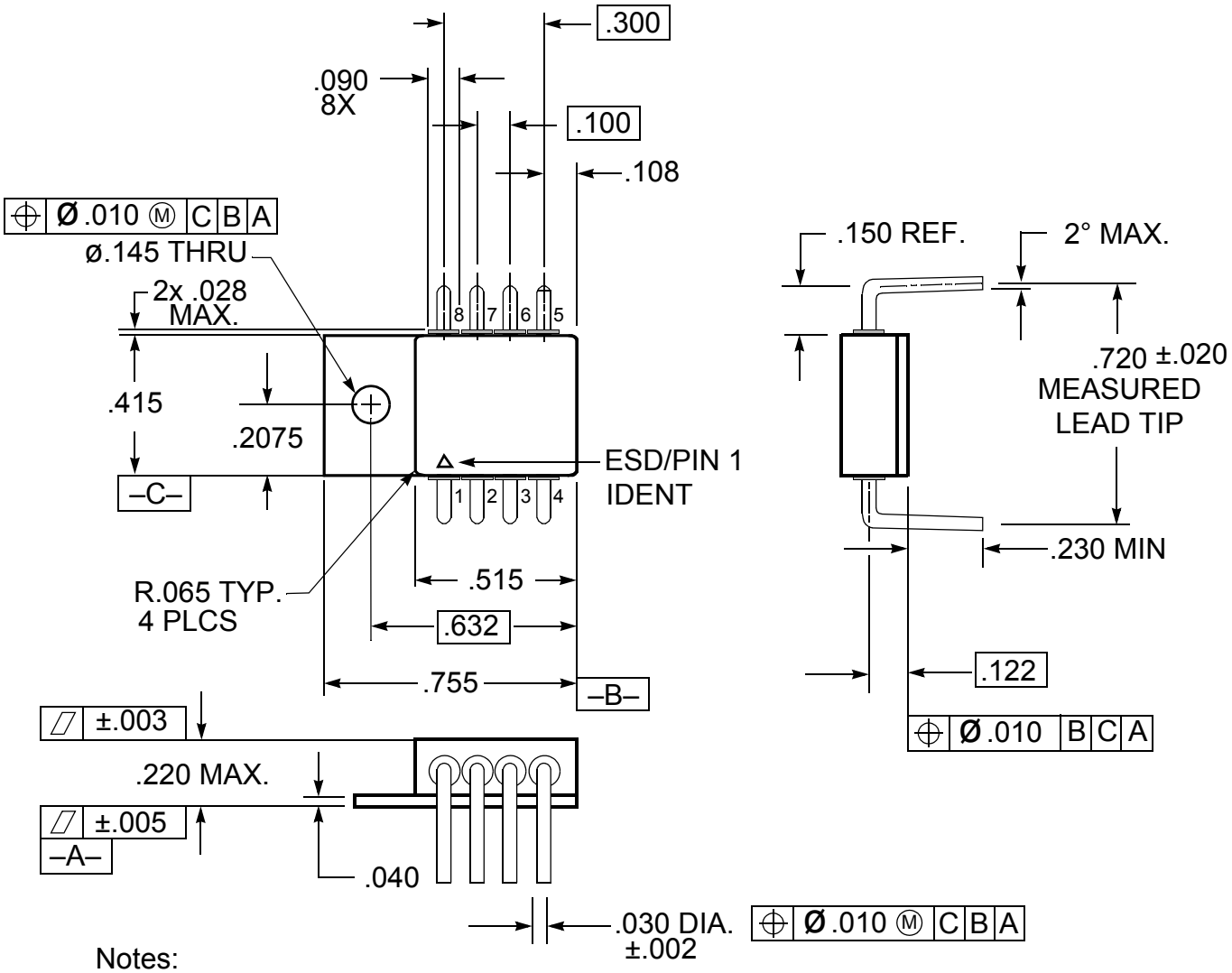


FIGURE 5 – BASIC VRG8697 ADJUSTABLE REGULATOR APPLICATION

TABLE I – PIN NUMBERS vs FUNCTION

PIN	FUNCTION
1	VCONTROL_1
2	VIN_1
3	VCONTROL_2
4	VIN_2
5	OUT_2
6	SET_2
7	OUT_1
8	SET_1

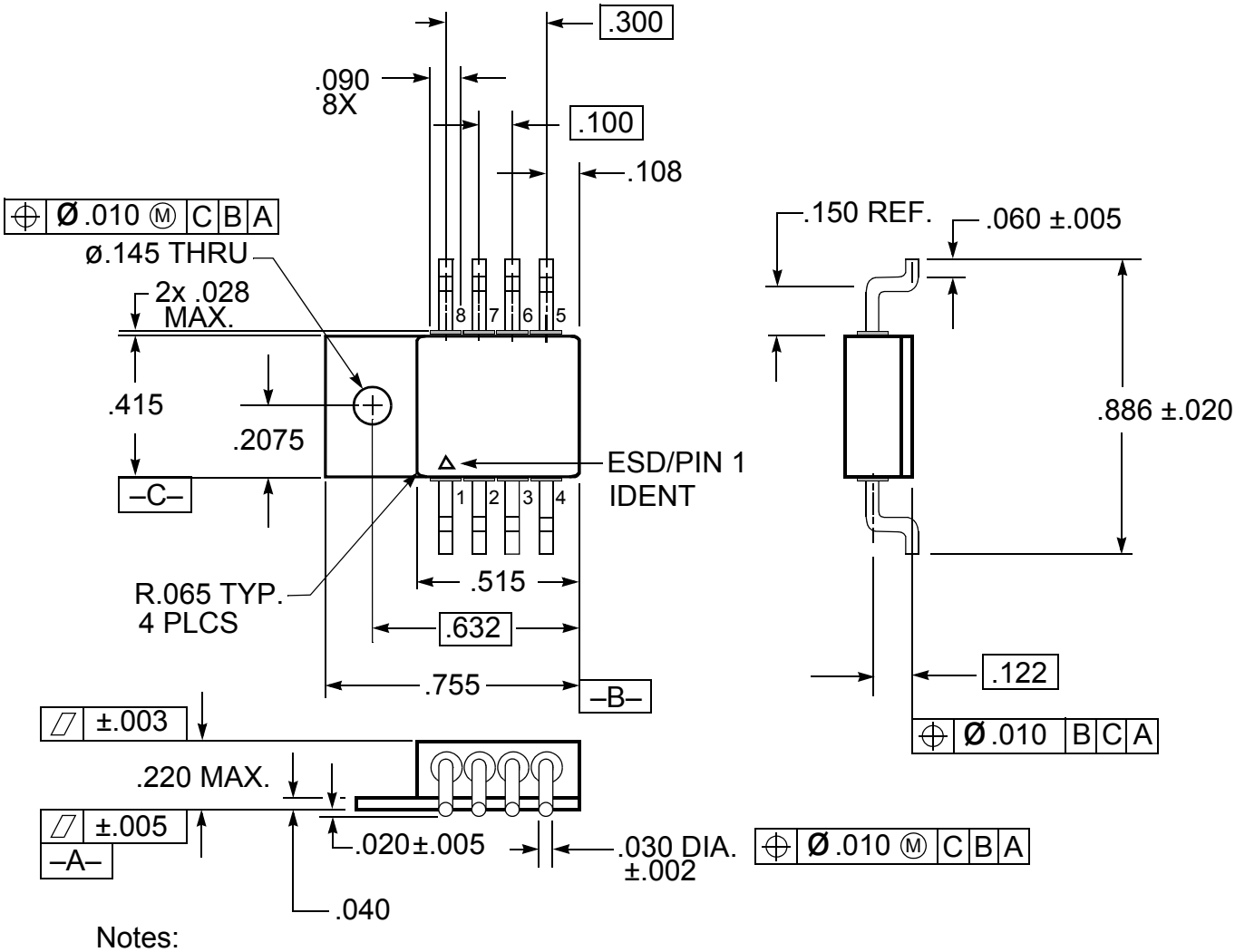


Notes:
1. Dimension Tolerance: ±.005 inches
2. Package contains BeO substrate
3. Case electrically isolated

FIGURE 6 – VRG8697 PACKAGE OUTLINE — THRU-HOLE POWER PACKAGE

TABLE II – PIN NUMBERS vs FUNCTION

PIN	FUNCTION
1	VCONTROL_1
2	VIN_1
3	VCONTROL_2
4	VIN_2
5	OUT_2
6	SET_2
7	OUT_1
8	SET_1



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

FIGURE 7 – VRG8698 PACKAGE OUTLINE — SURFACE MOUNT POWER PACKAGE

ORDERING INFORMATION

Model	DLA SMD #	Screening	Package
VRG8697-7	-	Commercial Flow, +25°C testing only	8-Lead Thru-Hole Power Pkg
VRG8697-901-1S	5962R1420201KUC	In accordance with DLA Certified RHA Program Plan to RHA Level "R", 100 krad(Si)	
VRG8697-901-2S	5962R1420201KUA		
VRG8698-7		Commercial Flow, +25°C testing only	8-Lead Surface-Mount Power Pkg
VRG8698-901-1S	5962R1420201KZC	In accordance with DLA Certified RHA Program Plan to RHA Level "R", 100 krad(Si)	
VRG8698-901-2S	5962R1420201KZA		

REVISION HISTORY

Date	Revision	Change Description
03/31/2016	F	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 RH3083, 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.

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