DATASHEET

REV L: 5/31/22

SCD8667

Dual 1A ULDO Adjustable Positive Voltage Regulators

VRG8667/68

Features

- Manufactured using Space Qualified RH3080 die
- Radiation performance
  - Total dose: 100 krad(Si), Dose rate = 50 - 300 rad(Si)/s
  - ELDRS: 50 krad(Si), Dose rate ≤ 0.01rad(Si)/s
- Two-Independent voltage regulators
- Current Limit with Foldback
- Over-temperature protection
- Output voltage adjustable: 0V to 35V
- Outputs may be paralleled for higher current
- Post Radiated Dropout voltage:
  - 0.60V @ 0.9Amps
  - 0.39V @ 0.5Amps
- Output current: 1.0Amps
- Packaging – Hermetic Meter Power Package
  - Thru-hole or Surface mount
  - 8 Leads, .755"L x .415"W x .220"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 VRG8667/8668 consists of two Positive Adjustable (RH3080) ULDO voltage regulators each capable of supplying 1.0Amps over the output voltage range as defined under recommended operating conditions. The VRG8667/8668 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 VRG8667/8668 has been specifically designed to meet exposure to radiation environments. The VRG8667 is configured for a Thru-Hole 8 lead metal power package and the VRG8668 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 VRG8667/8668 is ideal for demanding military and space applications.

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

Input capacitance is required for load regulation. 1uF is recommended on Vin and Vcontrol. For stable operation, a 0.1uF capacitor should be placed on Vset and a low ESR capacitor on Vout. See Figure 5.

For detailed performance characteristic curves, applications information and typical applications see the latest Linear Technology Corporation® data sheets for their RH/LT3080, which is available on-line at www.linear.com.

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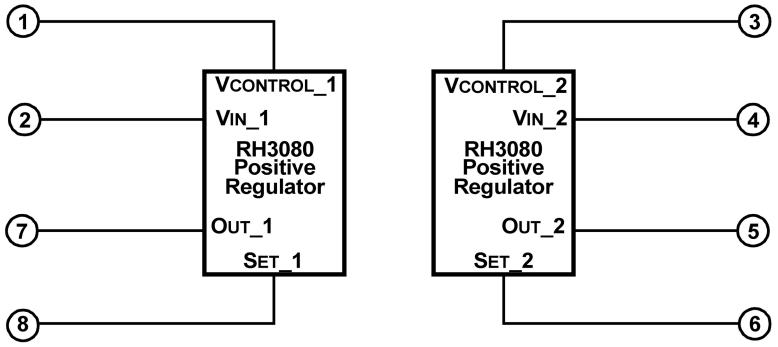

Figure 1 - Block Diagram / Schematic

Absolute Maximum Ratings

Parameter	Range	Units
Input Voltage, $V_{CONTROL}$ (Voltages are Relative to V_{OUT})	+40, -0.3	V_{DC}
Output Current	1.2	A
Lead temperature (soldering 10 Sec)	300	°C
Input Output Differential	26	V_{DC}
Output Voltage	36	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}	7	°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 35	V_{DC}
Input Output Differential	0.5 to 26	V_{DC}
Case Operating Temperature Range	-55 to +125	°C
Input Voltage (Voltages are Relative to V_{OUT})	1 to 36	V
$V_{CONTROL}$ (Voltages are Relative to V_{OUT})	1.6 to 36	V

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Electrical Performance Characteristics

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

Parameter	Symbol	Conditions (P ≤ P_{MAX}), 5/		MIN	MAX	Units
Set Pin Current	I_{REF_1}	1.0mA ≤ I_{LOAD} ≤ 1.0A, V_{IN} = 1.0V, $V_{CONTROL}$ = 2V		9.80	10.65	µA
Set Pin Current 1/	I_{REF_2}	V_{IN} = 1V, $V_{CONTROL}$ = 2V, I_{LOAD} = 1mA	+25°C	9.80	10.65	
Output Offset Voltage (V_{OUT} - V_{SET})	V_{OS}	V_{IN} = 1V, I_{LOAD} = 1mA,		-9.0	9.0	mV
		V_{IN} = 1V, I_{LOAD} = 1mA, 1/	+25°C	-9.0	9.0	
Line Regulation	ΔV_{OS}	1.6V ≤ V_{IN} ≤ 25V, 2V < $V_{CONTROL}$ < 26V, I_{LOAD} = 1mA		-0.19	0.19	mV/V
		1V ≤ V_{IN} ≤ 26V, 2V ≤ $V_{CONTROL}$ ≤ 26V, I_{LOAD} = 1mA, 1/, 2/	+25°C	-0.15	0.15	
Load Regulation	ΔV_{OS}	V_{IN} = 1.6V, I_{LOAD} = 1mA to 0.1A		-1.4	1.4	mV
		I_{LOAD} = 1mA to 0.9A, 4/	+25°C	-1.4	1.4	
$V_{CONTROL}$ Dropout Voltage 2/	V_{CDROP}	V_{IN} = 0.6V, I_{LOAD} = 1.0A	+25°C, +125°C	-	1.65	V
		V_{IN} = 0.6V, I_{LOAD} = 0.9A	-55°C	-	1.73	
		V_{IN} = 1V, I_{LOAD} = 0.1A to 0.9A, 1/, 4/	+25°C	-	1.60	
V_{IN} Dropout Voltage 2/	V_{INDROP}	I_{LOAD} = 1.0A, $V_{CONTROL}$ = 2V	+25°C, +125°C	-	0.52	V
		I_{LOAD} = 0.8A, $V_{CONTROL}$ = 2V	-55°C	-	0.65	
		I_{LOAD} = 0.1A, $V_{CONTROL}$ = 2V, 1/, 4/	+25°C	-	0.25	
		I_{LOAD} = 0.8A, $V_{CONTROL}$ = 2V, 1/, 4/	+25°C	-	0.50	
Current Limit 3/	I_{MAX}	V_{IN} = $V_{CONTROL}$ = +5V, V_{OUT} = 1.0V	+25°C	1.1	-	A
Minimum Load Current, 4/	I_{MIN}	V_{IN} = $V_{CONTROL}$ = 26V	+125°C, -55°C	-	1	mA
		V_{IN} = $V_{CONTROL}$ = 26V, 1/	+25°C	-	0.9	
Ripple Rejection	-	I_{LOAD} = 0.2A, V_{IN} = 3V, f = 120Hz, C_{OUT} = 2.2µF, C_{SET} = 0.1µF		60	-	dB
Thermal Regulation	-	30ms pulse	+25°C		0.03	%/W

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. (See note 1/).
4) Not production tested. Shall be guaranteed to the specified limits.
5) Vin and Vcontrol are referenced to Vout unless otherwise stated.

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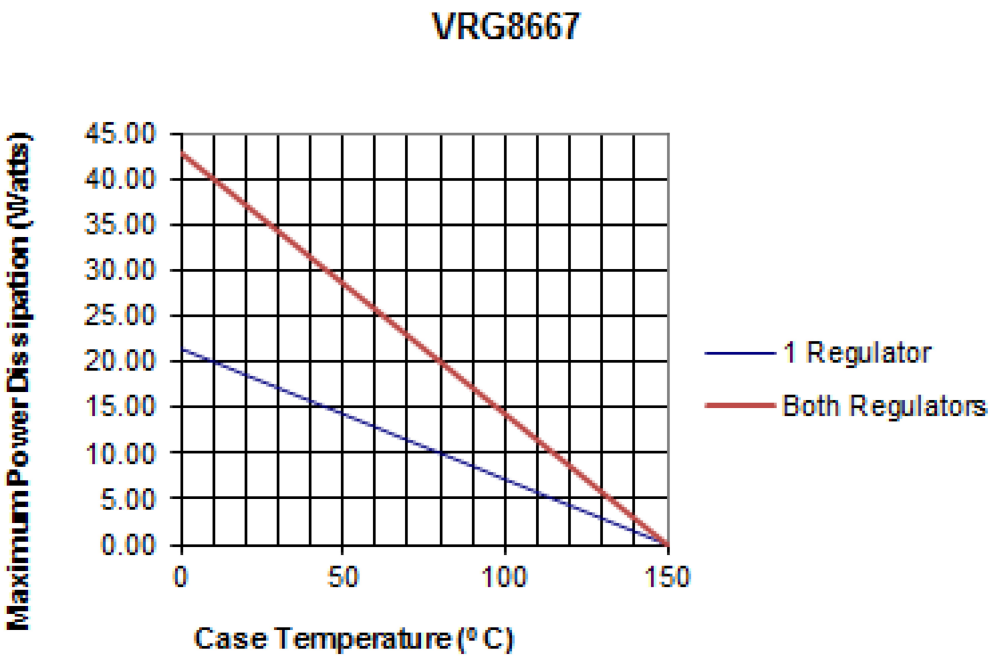

Figure 2 - Maximum Power vs Case Temperature

The maximum Power dissipation is limited by the thermal shutdown function of each regulator chip in the VRG8667/8668.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 VRG8667/8668 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 VRG8667/8668 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 7°C/W.

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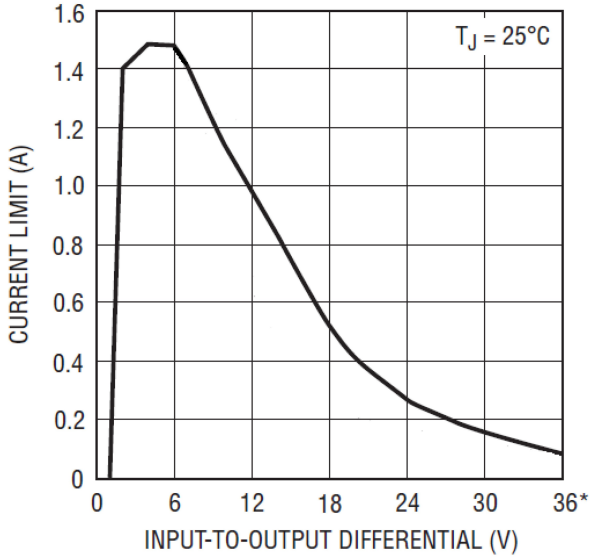

Figure 3 - RH3080 Current Limit

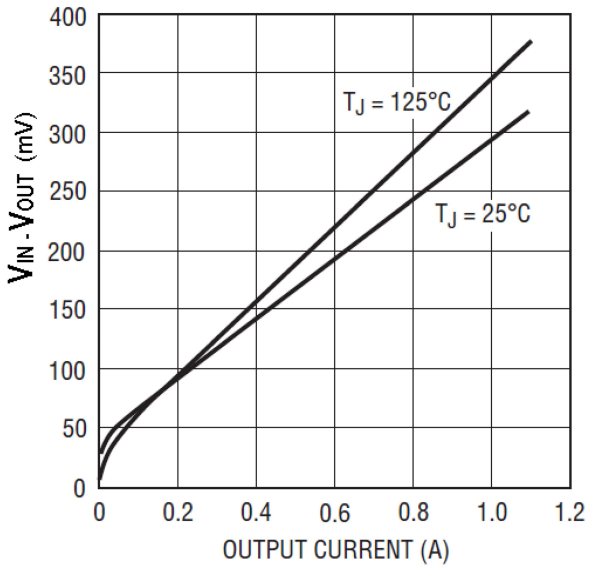

Figure 4 - RH3080 Typical Dropout Voltage Curve ($V_{CONTROL}$ ≥ 1.6V)

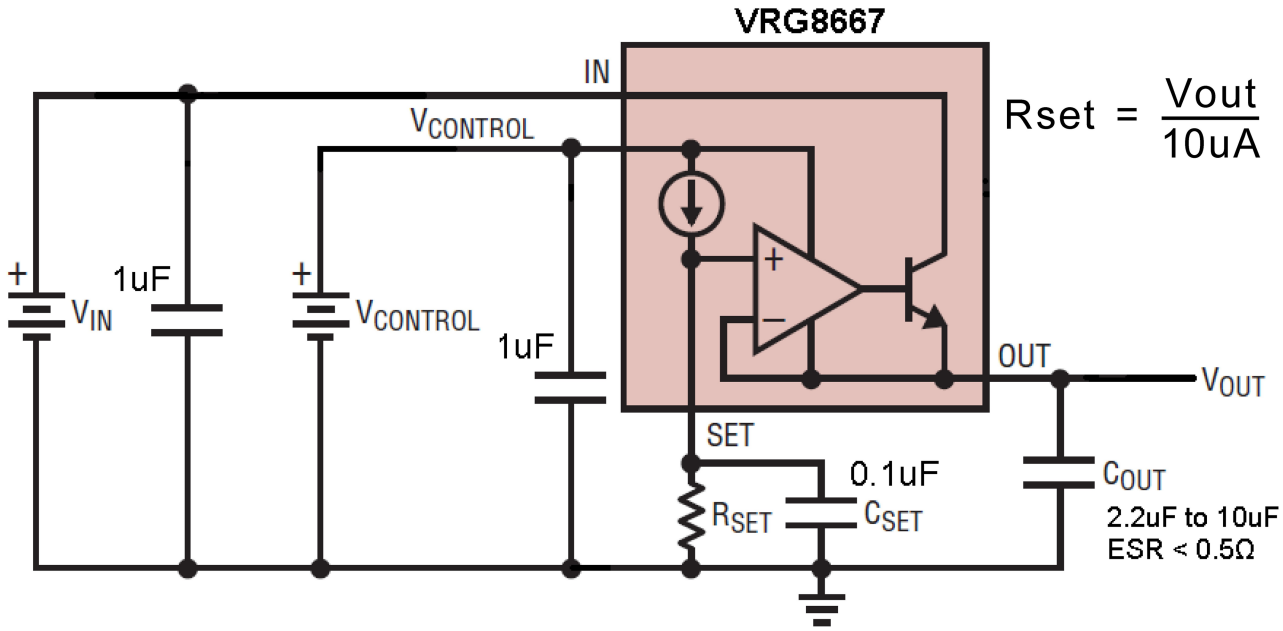

Figure 5 - Basic VRG8667 Adjustable Regulator Application

Note:

1) All Capacitors are required for stable operation

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Table I – Pin Numbers vs Function

Pin	Function
1	$V_{CONTROL}\_1$
2	V_{IN}_1
3	$V_{CONTROL}\_2$
4	V_{IN}_2
5	O_{UT}_2
6	S_{ET}_2
7	O_{UT}_1
8	S_{ET}_1

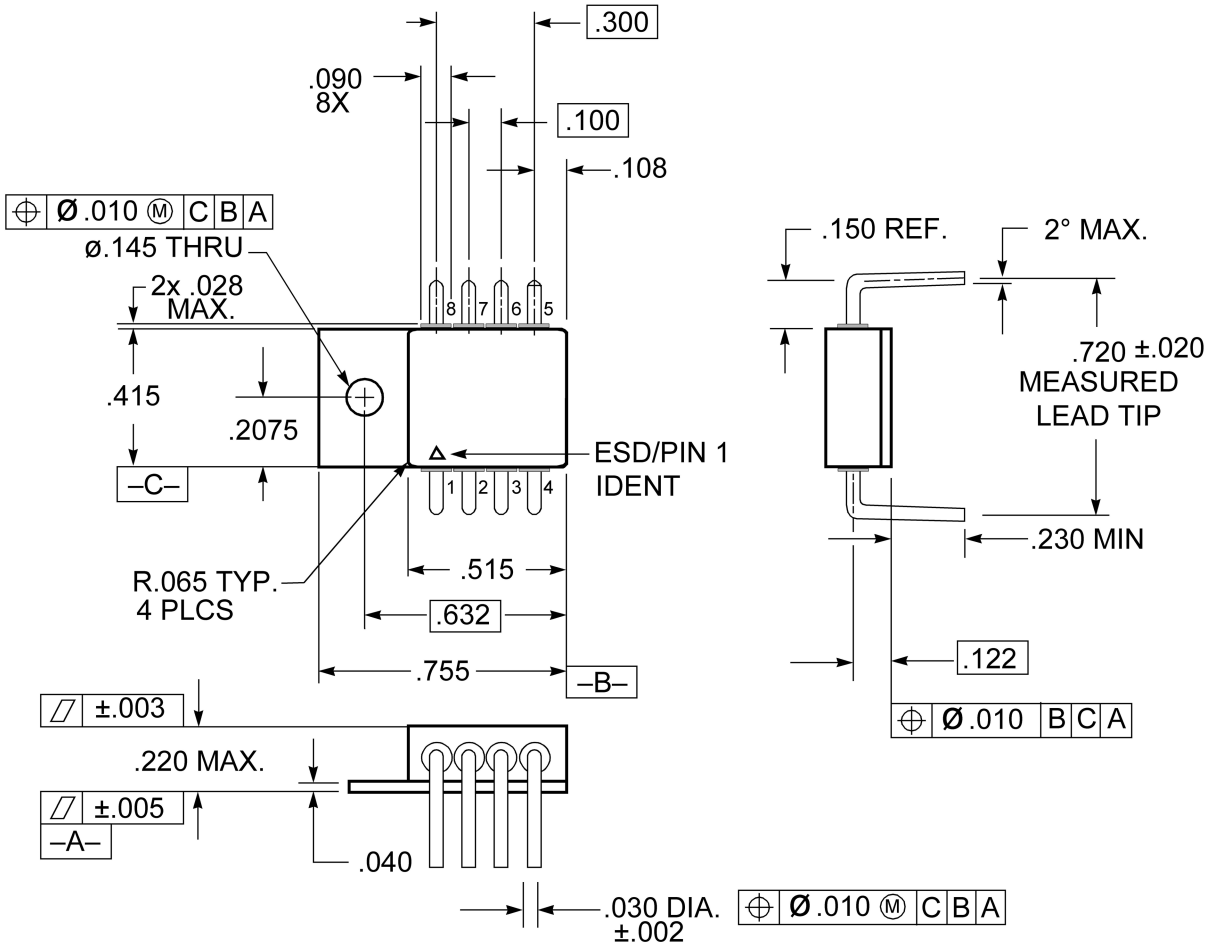

Figure 6 - VRG8667 Package Outline — Thru-Hole Power Package

Notes:

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

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Table II – Pin Numbers vs Function

Pin	Function
1	$V_{CONTROL}\_1$
2	V_{IN}_1
3	$V_{CONTROL}\_2$
4	V_{IN}_2
5	O_{UT}_2
6	S_{ET}_2
7	O_{UT}_1
8	S_{ET}_1

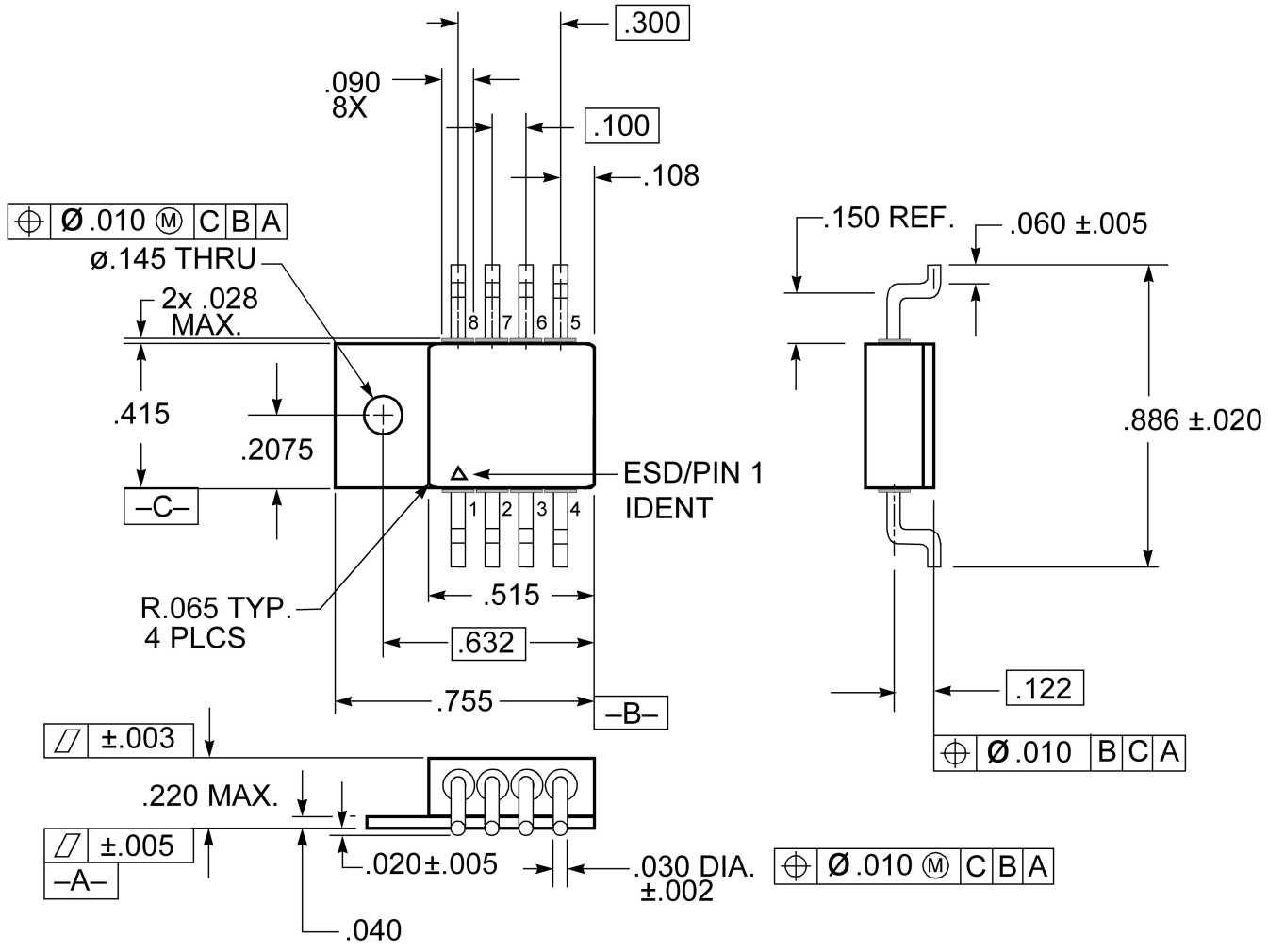

Figure 7 - VRG8668 Package Outline — Surface Mount Power Package

Notes:

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

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Ordering Information

Model	DLA SMD #	Screening	Package
VRG8667-7	-	Commercial Flow, +25°C testing only	8-Lead Thru-Hole Power Pkg
VRG8667-901-1S	5962R1320301KUC	In accordance with DLA Certified RHA Program Plan to RHA Level "R", 100 krad(Si)	
VRG8667-901-2S	5962R1320301KUA		
VRG8668-7		Commercial Flow, +25°C testing only	8-Lead Surface-Mount Power Pkg
VRG8668-901-1S	5962R1320301KZC	In accordance with DLA Certified RHA Program Plan to RHA Level "R", 100 krad(Si)	
VRG8668-901-2S	5962R1320301KZA		

Revision History

Date	Revision	Change Description
09/12/2017	H	Revised per ECN 8667-21
12/14/2020	J	Revised per ECN 23408
03/26/2021	K	Revised per ECN 23566.

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Datasheet Definitions

	DEFINITION
Advanced Datasheet	CAES reserves the right to make changes to any products and services described herein at any time without notice. The product is still in the development stage and the datasheet **is subject to change**. Specifications can be **TBD** and the part package and pinout are **not final**.
Preliminary Datasheet	CAES reserves the right to make changes to any products and services described herein at any time without notice. The product is in the characterization stage and prototypes are available.
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