

SCD8657

Dual 1A LDO Adjustable Positive Voltage Regulators

VRG8657/58

Features

- Manufactured using Linear Technologies Space Qualified RH1086 die
- Radiation performance
 - Total dose ≥ 100 krad(Si)
- Two-Independent voltage regulators
- Thermal shutdown
- Output voltage adjustable: 1.25V to 23V
- Dropout voltage: 1.3V at 1.0Amp
- 3-Terminal
- Output current: 1.0Amp
- Voltage reference: 1.25V +2%, -3.2%
- Load regulation: 0.3% max
- Line regulation: 0.25% max
- Ripple rejection: >60dB
- Packaging - Hermetic metal
 - Thru-hole, Surface mount or Straight Lead
 - 6 Leads, .655"L x .415"W x .200"Ht
 - Power package
 - Weight - 5 gm max
- Designed for aerospace and high reliability space applications
- **Radiation Hardness Assurance Plan: DLA Certified to MIL-PRF-38534, Appendix G.**

Description

The VRG8657/8658 consists of two Positive Adjustable (RH1086) LDO voltage regulators each capable of supplying 1.0Amps over the output voltage range as defined under recommended operating conditions. The VRG8657/8658 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 VRG8657/8658 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 VRG8657/8658 has been specifically designed to meet exposure to radiation environments. The VRG8657 is configured for a Thru-Hole 6 lead metal power package and the VRG8658 is configured for a Surface Mount 6 lead metal power package. It is guaranteed operational from -55°C to +125°C. Available screened to MIL-STD-883, the VRG8657/8658 is ideal for demanding military and space applications.

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

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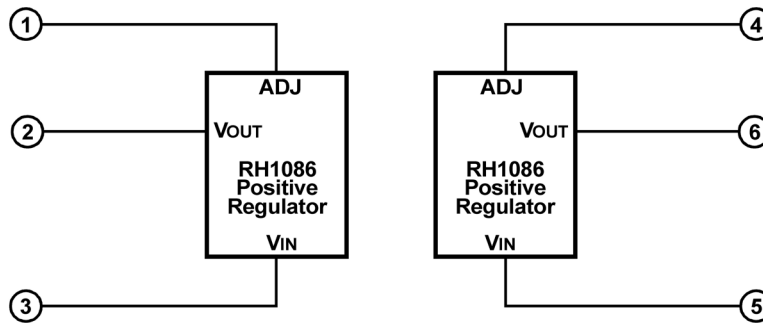


Figure 1 - Block Diagram / Schematic

Absolute Maximum Ratings

Parameter	Range	Units
Input Voltage	25+V _{REF}	V _{DC}
Lead temperature (soldering 10 Sec)	300	°C
Input Output Differential	25	V _{DC}
Output Voltage	+25	V _{DC}
DC Output Current	1.5	A
ESD (MIL-STD-883, M3015, Class 3A)	>4000	V
Operating Junction Temperature Range	-55 to +150	°C
Storage Temperature Range	-65 to +150	°C

NOTICE: Stresses above those listed under "Absolute Maximums Rating" 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	1.275 to 23	V _{DC}
Input Output Differential \geq	1.5 to 25	V _{DC}
Case Operating Temperature Range	-55 to +125	°C
Thermal Resistance, Junction to case θ_{JC}	5	°C/W

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Electrical Performance Characteristics

Unless otherwise specified, $-55^{\circ}\text{C} \leq \text{TC} \leq +125^{\circ}\text{C}$

Parameter	SYM	Conditions ($P \leq P_{\text{MAX}}$)	MIN	MAX	Units
Reference Voltage <u>2/</u> <u>3/</u>	V_{REF}	$1.5\text{V} \leq V_{\text{IN}} - V_{\text{OUT}} \leq 15\text{V}$, $10\text{mA} \leq I_{\text{OUT}} \leq 1.0\text{A}$	1.210	1.275	V
Line Regulation <u>2/</u> <u>3/</u>	$\frac{\Delta V_{\text{OUT}}}{\Delta V_{\text{IN}}}$	$I_{\text{LOAD}} = 10\text{mA}$, $1.5\text{V} < V_{\text{IN}} - V_{\text{OUT}} \leq 15\text{V}$	-	0.25	%
Load Regulation <u>2/</u> <u>3/</u>	$\frac{\Delta V_{\text{OUT}}}{\Delta I_{\text{OUT}}}$	$10\text{mA} \leq I_{\text{OUT}} \leq 1.0\text{A}$, $V_{\text{IN}} - V_{\text{OUT}} = 3\text{V}$	-	0.3	%
Dropout Voltage <u>2/</u> <u>4/</u>	V_{DROP}	$\Delta V_{\text{REF}} = 1\%$, $I_{\text{OUT}} = 1.0\text{A}$	-	1.30	V
Adjust Pin Current <u>2/</u>	-		-	120	μA
Adjust Pin Current Change <u>2/</u>	-	$10\text{mA} \leq I_{\text{OUT}} \leq 1\text{A}$, $1.5\text{V} \leq V_{\text{IN}} - V_{\text{OUT}} \leq 15\text{V}$	-	5	μA
Current Limit <u>2/</u> <u>6/</u>	I_{MAX}	$V_{\text{IN}} - V_{\text{OUT}} = 5\text{V}$ $V_{\text{IN}} - V_{\text{OUT}} \leq 25\text{V}$	1.5 0.047	- -	A A
Minimum Load Current <u>5/</u>	I_{MIN}	$V_{\text{IN}} - V_{\text{OUT}} = 25\text{V}$	-	10	mA
Ripple Rejection <u>3/</u>	-	$I_{\text{OUT}} = 1.0\text{A}$, $V_{\text{IN}} - V_{\text{OUT}} = 3\text{V}$, $f = 120\text{Hz}$, $C_{\text{ADJ}} = C_{\text{OUT}} = 25\mu\text{F}$	60	-	dB
Thermal Regulation	-	30ms pulse, $T_{\text{C}} = +25^{\circ}\text{C}$	-	0.04	%/W
V_{REF} Long-Term Stability <u>5/</u>	-	Burn In: $T_{\text{C}} = +125^{\circ}\text{C}$ @ 1000hrs minimum, tested @ 25°C	-	0.3	%

Notes:

- 1) For compliance with MIL-STD- 883 revision C current density specification, the RH1086MK is derated to 1 Amp but is capable of 1.5 Amps.
- 2) Line and load regulation are guaranteed up to the maximum power dissipation of 15W. 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.
- 3) Dropout voltage is specified over the full output current range of the device.
- 4) Not tested. Shall be guaranteed by design, characterization, or correlation to other tested parameters.
- 5) Pulsed @ <10% duty cycle @ $+25^{\circ}\text{C}$ (See Note 1).

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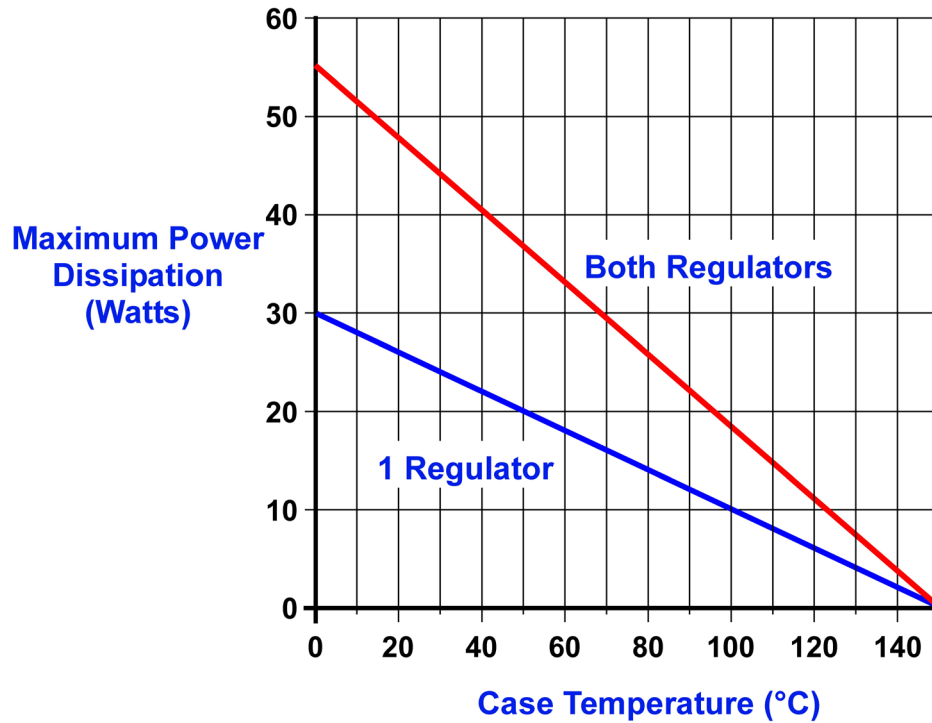


Figure 2 - Maximum Power Vs Case Temperature

The maximum Power dissipation is limited by the thermal shutdown function of each regulator chip in the VG8657/8658. 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 VG8657/8658 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 dissipation of the VG8657/8658 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.

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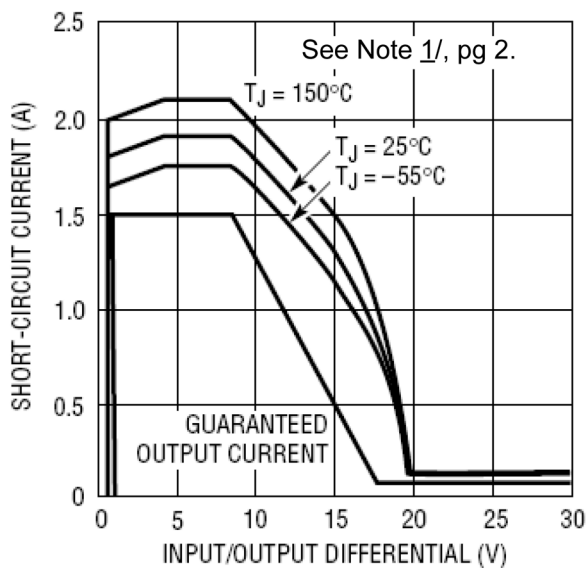


Figure 3 - RH1086 Short Circuit Current

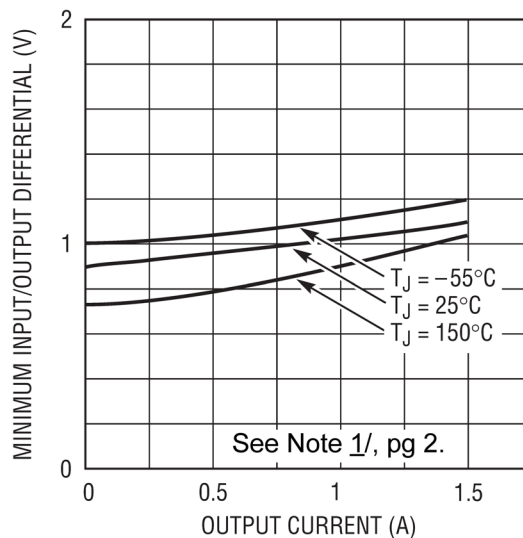


Figure 4 - RH1086 Dropout Voltage Typical Curve

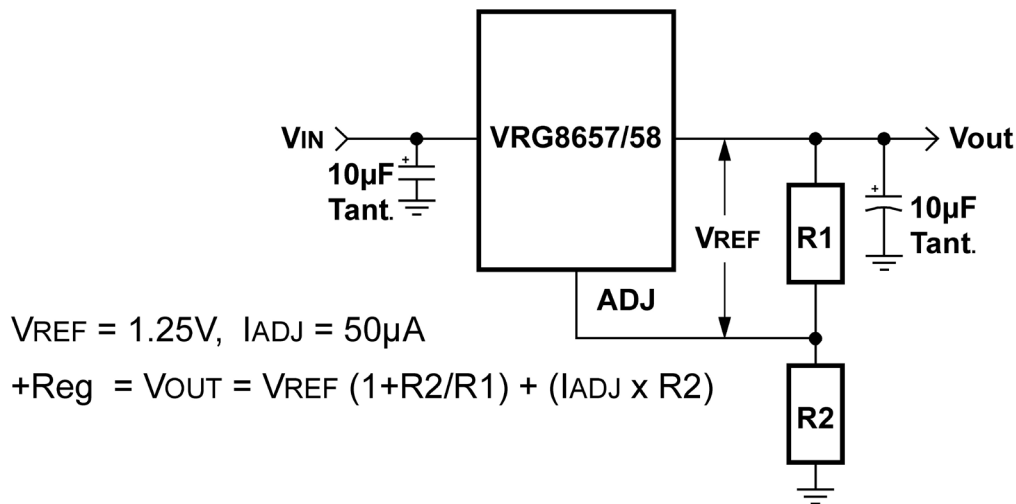


Figure 5 - Basic RH1086 Adjustable Regulator Application

Table I - Pin Numbers vs Function

Pin	Function
1	POS_ADJ_1
2	POS_VOUT_1
3	POS_VIN_1
4	POS_ADJ_2
5	POS_VIN_2
6	POS_VOUT_2

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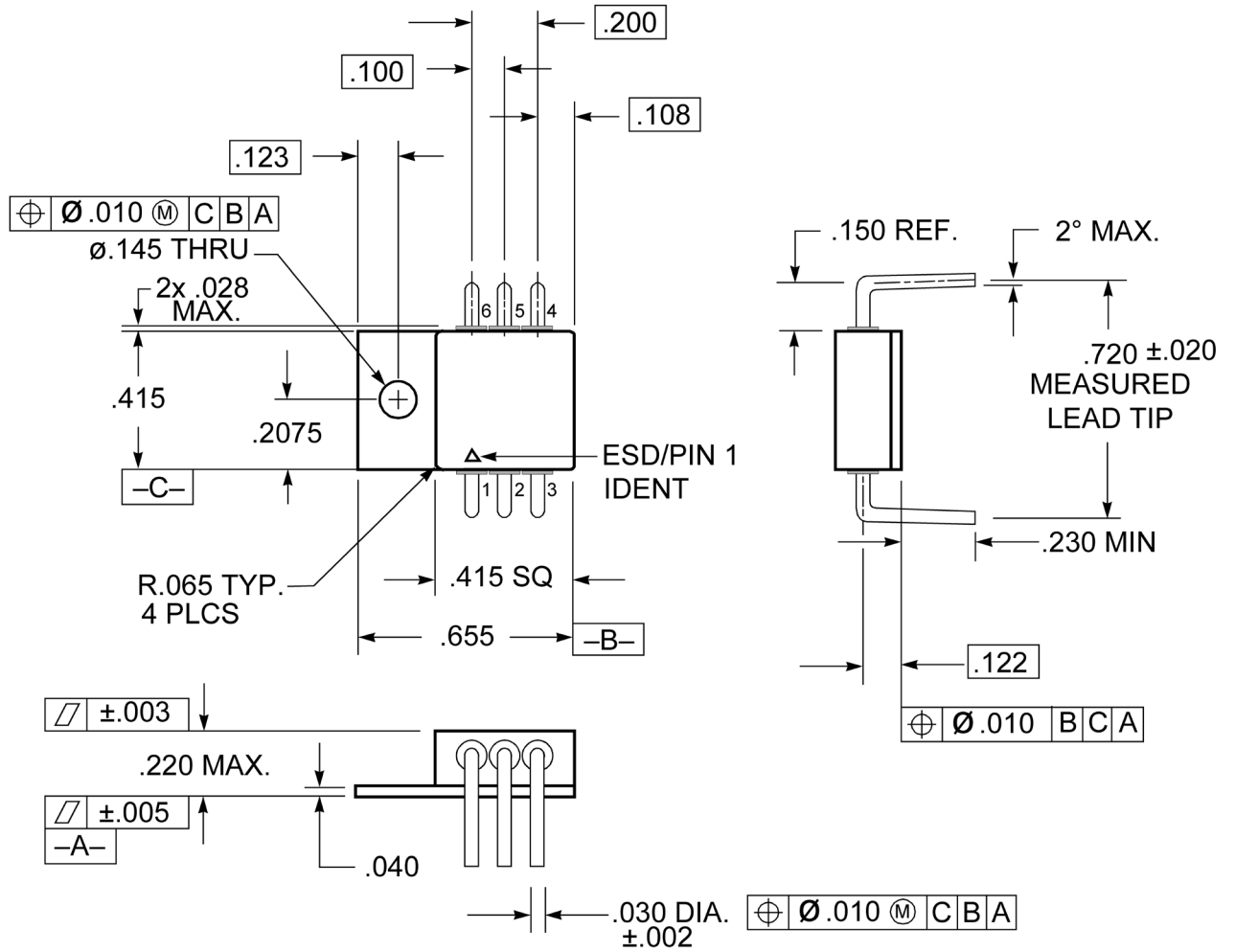


Figure 6 - Package Outline - Thru-Hole Power Package

Notes:

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

Table II - Pin Numbers vs Function

Pin	Function
1	POS_ADJ_1
2	POS_VOUT_1
3	POS_VIN_1
4	POS_ADJ_2
5	POS_VIN_2
6	POS_VOUT_2

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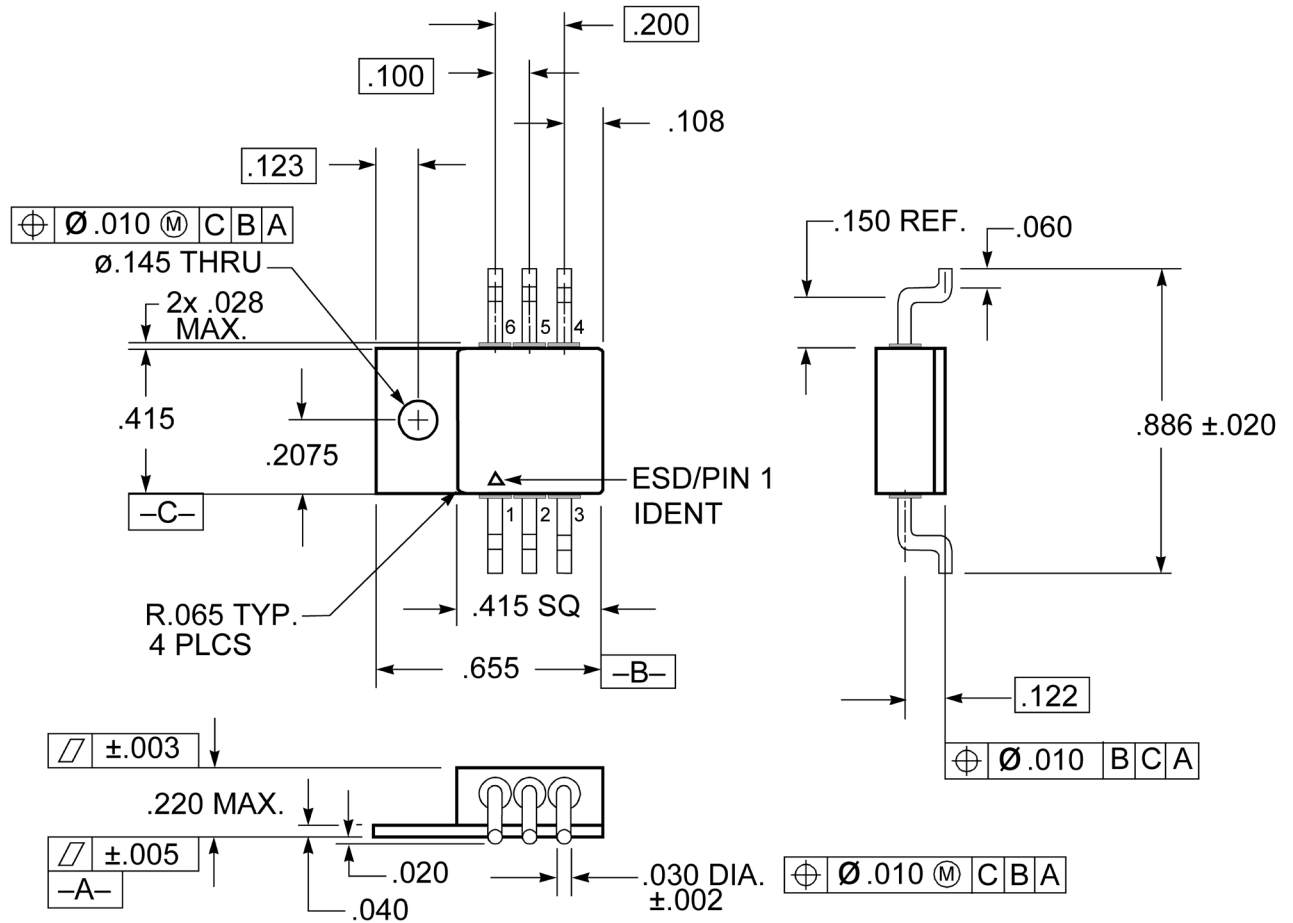


Figure 7 - Package Outline — Surface Mount Power Package

Notes:

- 1) Dimension Tolerance: $\pm .005$ inches
- 2) Package contains BeO substrate
- 3) Case electrically isolated

Table III - Pin Numbers vs Function

Pin	Function
1	POS_ADJ_1
2	POS_VOUT_1
3	POS_VIN_1
4	POS_ADJ_2
5	POS_VIN_2
6	POS_VOUT_2

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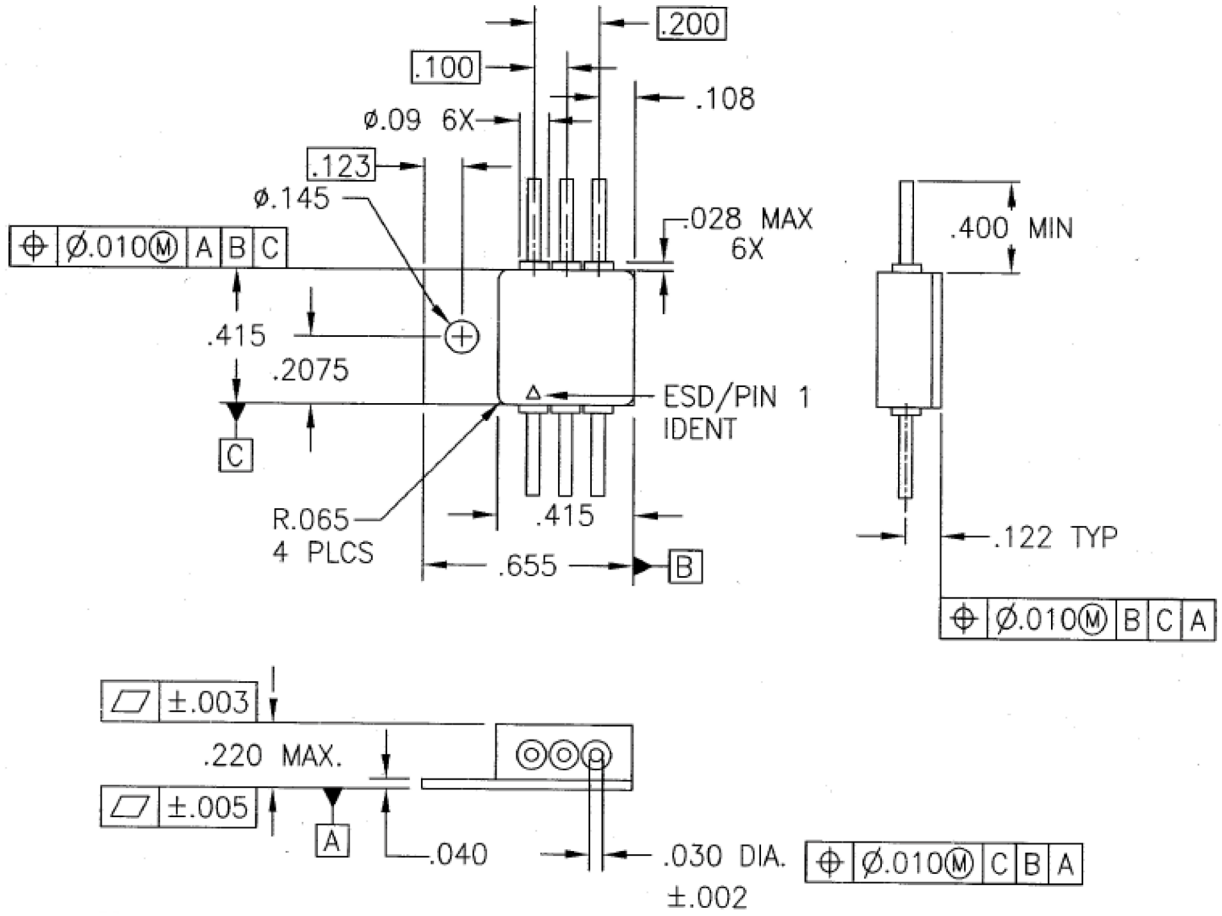


Figure 8 - Package Outline — Straight Lead (Unformed) Power Package

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
VRG8657-7	-	Commercial Flow, +25°C testing only	6 Lead Thru-Hole Power Pkg
VRG8657-S	-	Military Temperature, -55°C to +125°C Screened in accordance with the individual Test Methods of MIL-STD-883 for Space Applications	
VRG8657-201-1S	5962-0920102KXC	In accordance with DLA SMD	
VRG8657-201-2S	5962-0920102KXA		
VRG8657-901-1S	5962R0920102KXC	In accordance with DLA Certified RHA Program Plan to RHA Level "R", 100 krad(Si)	
VRG8657-901-2S	5962R0920102KXA		
VRG8658-7	-	Commercial Flow, +25°C testing only	6 Lead Surface Mount Power Pkg
VRG8658-S	-	Military Temperature, -55°C to +125°C Screened in accordance with the individual Test Methods of MIL-STD-883 for Space Applications	
VRG8658-201-1S	5962-0920102KYC	In accordance with DLA SMD	
VRG8658-201-2S	5962-0920102KYA		
VRG8658-901-1S	5962R0920102KYC	In accordance with DLA Certified RHA Program Plan to RHA Level "R", 100 krad(Si)	
VRG8658-901-2S	5962R0920102KYA		
VRG8658-702	-	Commercial Flow, +25°C testing only	6 Lead Straight Lead Power Pkg
VRG8658-202-1S	5962-0920102KTC	In accordance with DLA SMD	
VRG8658-902-1S	5962R0920102KTC	In accordance with DLA Certified RHA Program Plan to RHA Level "R", 100 krad(Si)	

Revision History

Date	Revision	Change Description
03/24/2016	L	Import into CAES format
03/02/2017	M	Add straight lead part numbers to the Ordering Information Table: 8658-702, 8658-202-1S and 8658-902-1S. Add Table III and Figure 8 for the Straight Lead Package version. Show Straight Lead package in the Features - Packaging section.
03/26/2021	P	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.
Datasheet	Product is in production and any changes to the product and services described herein will follow a formal customer notification process for form, fit or function changes.

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