Voltage Regulator

VRG8657/58

Dual 1A 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 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 or Surface mount
  - 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.

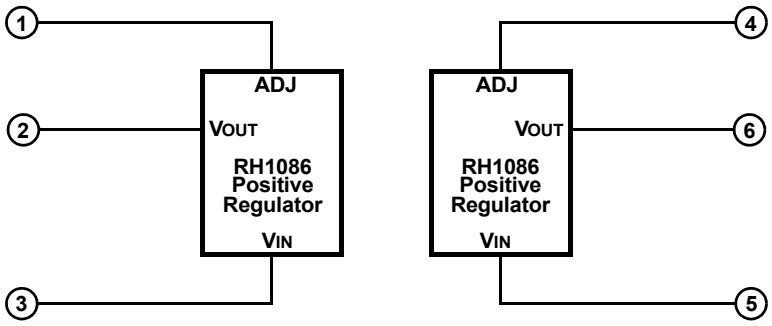


FIGURE 1 – BLOCK DIAGRAM / SCHEMATIC

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 3/	1.5 to 25	V_{DC}
Case Operating Temperature Range	-55 to +125	°C
Thermal Resistance, Junction to case θ_{JC}	5	°C/W

ELECTRICAL PERFORMANCE CHARACTERISTICS

Unless otherwise specified, -55°C≤T_C≤+125°C

PARAMETER	SYM	CONDITIONS ($P \leq P_{MAX}$)	MIN	MAX	UNITS
Reference Voltage 2/ 3/	V_{REF}	1.5V ≤ V_{IN} - V_{OUT} ≤ 15V, 10mA ≤ I_{OUT} ≤ 1.0A	1.210	1.275	V
Line Regulation 2/ 3/	$\frac{\Delta V_{OUT}}{\Delta V_{IN}}$	I_{LOAD} = 10mA, 1.5V ≤ V_{IN} - V_{OUT} ≤ 15V	-	0.25	%
Load Regulation 2/ 3/	$\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$	10mA ≤ I_{OUT} ≤ 1.0A, V_{IN} - V_{OUT} = 3V	-	0.3	%
Dropout Voltage 2/ 4/	V_{DROP}	ΔV_{REF} = 1%, I_{OUT} = 1.0A	-	1.30	V
Adjust Pin Current 2/	-		-	120	µA
Adjust Pin Current Change 2/	-	10 mA ≤ I_{OUT} ≤ 1A, 1.5V ≤ V_{IN} - V_{OUT} ≤ 15V	-	5	µA
Current Limit 2/ 6/	I_{MAX}	V_{IN} - V_{OUT} = 5V V_{IN} - V_{OUT} ≤ 25V	1.5 0.047	- -	A A
Minimum Load Current 5/	I_{MIN}	V_{IN} - V_{OUT} = 25V	-	10	mA
Ripple Rejection 3/	-	I_{OUT} = 1.0A, 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
V_{REF} Long-Term Stability 5/	-	Burn In: T_C = +125°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.
3/ 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.
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.
6/ Pulsed @ <10% duty cycle @ +25°C (See Note 1).

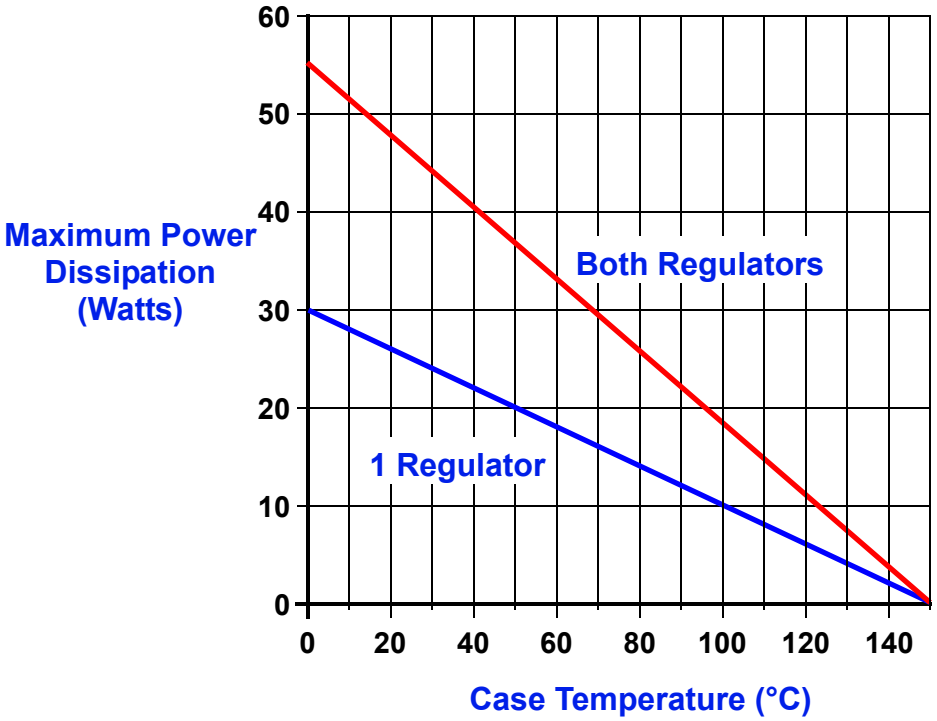


FIGURE 2 – MAXIMUM POWER vs CASE TEMPERATURE

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 that 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.

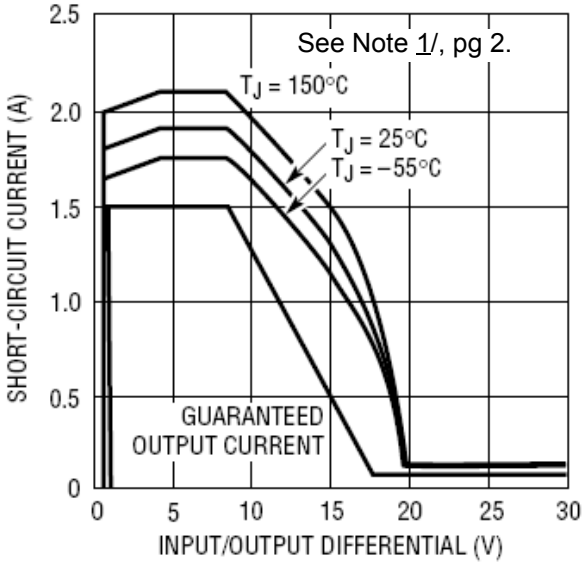


FIGURE 3 – RH1086 SHORT CIRCUIT CURRENT

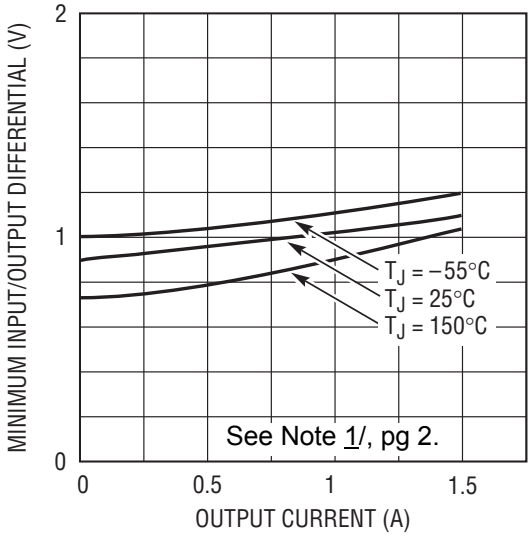
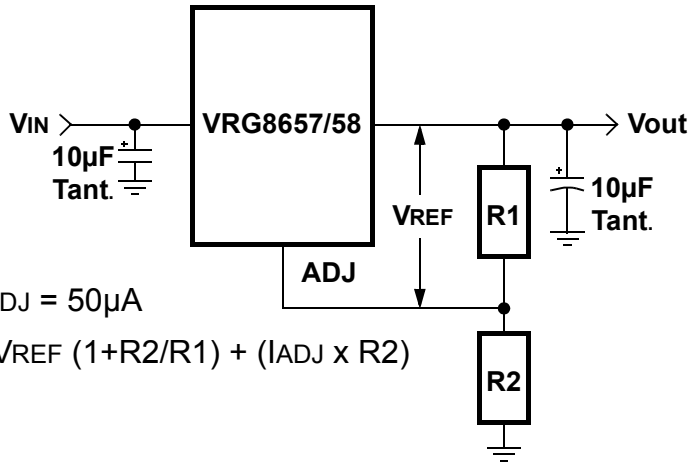


FIGURE 4 – RH1086 DROPOUT VOLTAGE TYPICAL CURVE



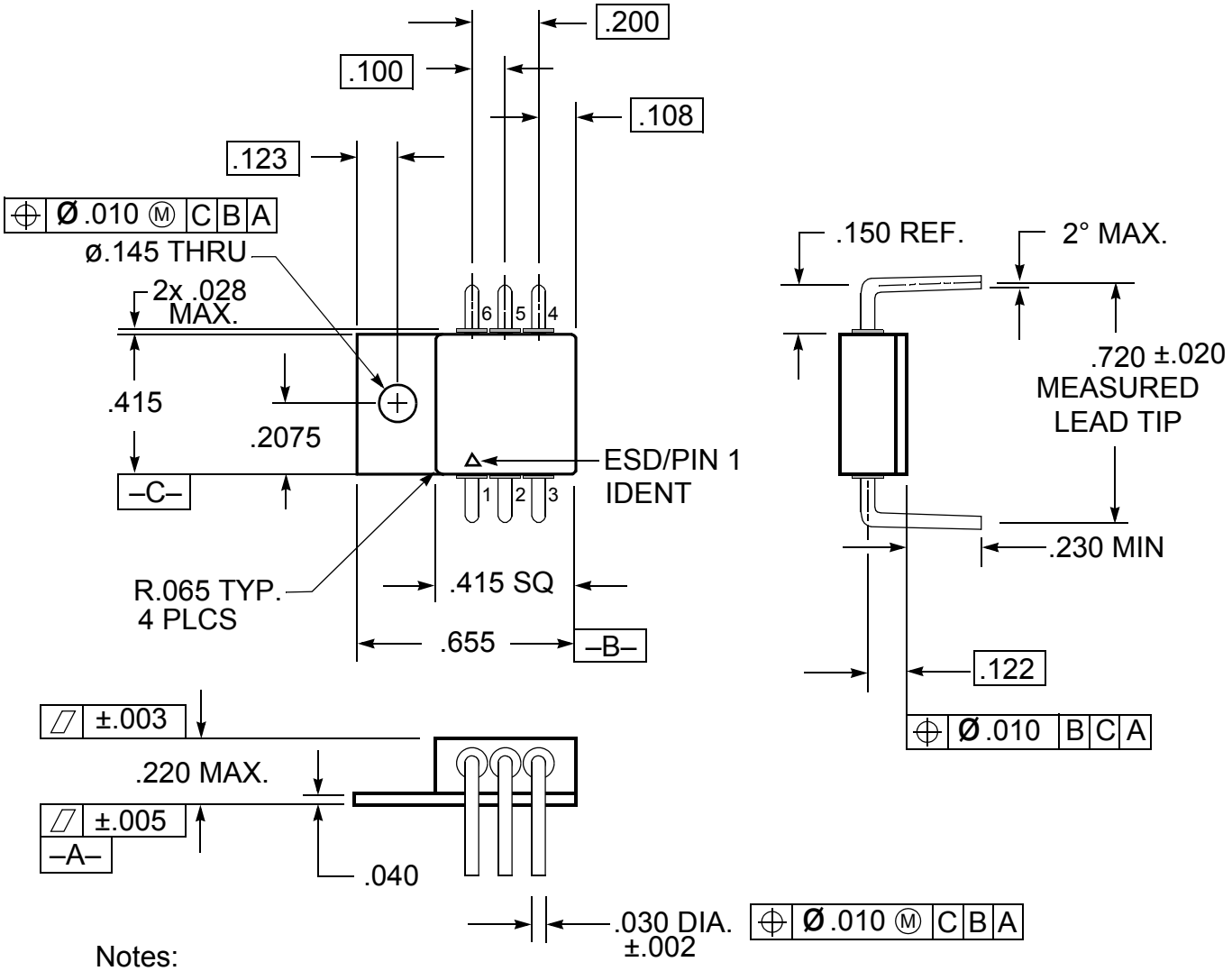
V_{REF} = 1.25V, I_{ADJ} = 50µA

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

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

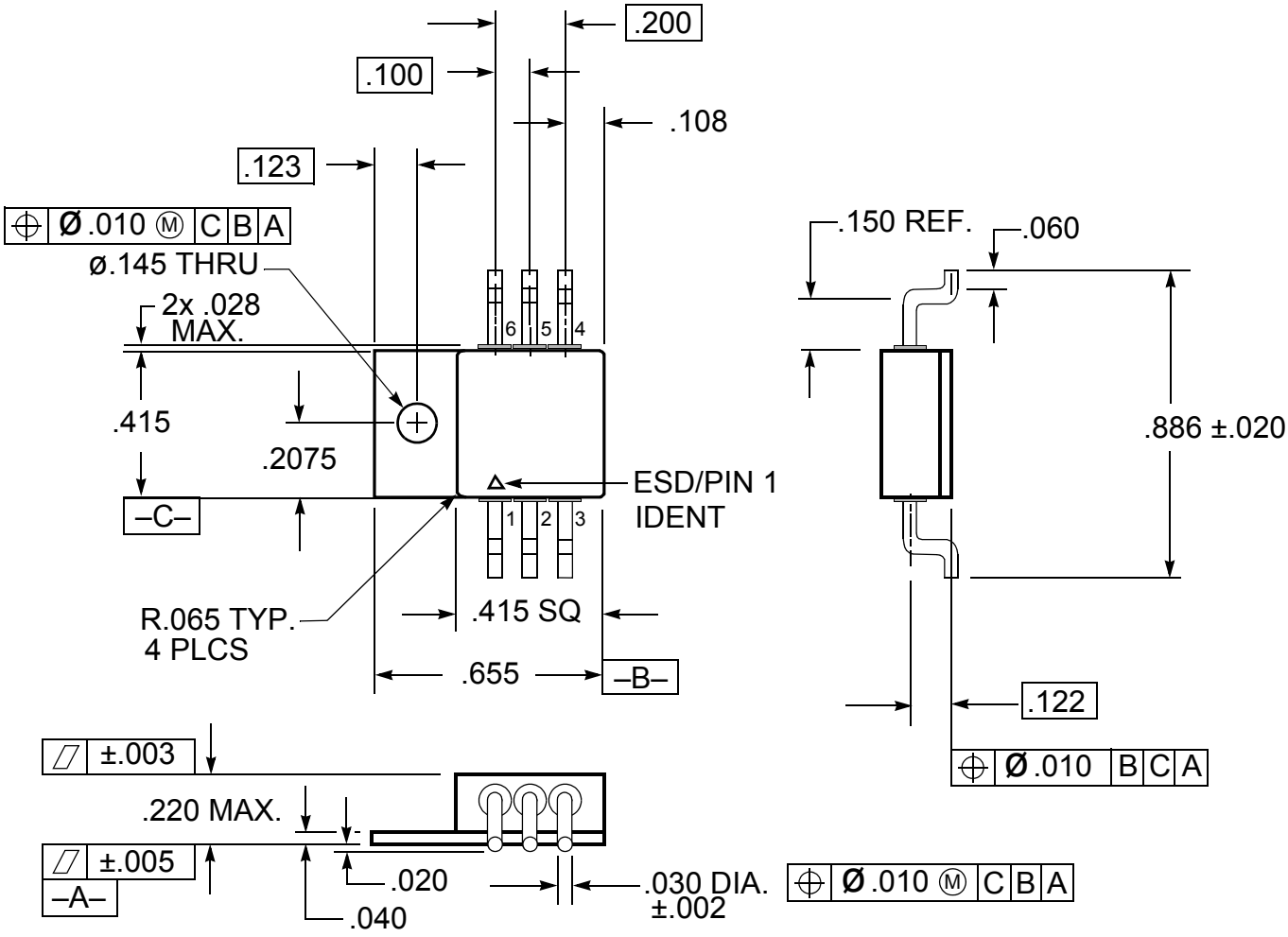


Notes:
1. Dimension Tolerance: ±.005 inches
2. Package contains BeO substrate
3. Case electrically isolated

FIGURE 6 – PACKAGE OUTLINE — THRU-HOLE POWER PACKAGE

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



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

FIGURE 7 – PACKAGE OUTLINE — SURFACE MOUNT POWER PACKAGE

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		

REVISION HISTORY

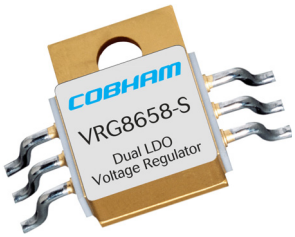
Date	Revision	Change Description
03/24/2016	L	Import into Cobham format

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 RH1086, 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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