Data Sheet June 2004 FN9054.1

Radiation Hardened Negative Low Dropout Adjustable Voltage Regulator

The radiation hardened ISL72991RH is a low dropout adjustable negative regulator with an output voltage range of -2.25V to -26V. The device features a 1A output current capability, an adjustable current limit pin (I_{LIM}) and a shutdown pin (SD) for easy on/off control.

The device incorporates unique circuitry that enables precision performance over the -55°C to +125°C temperature range and post-irradiation. Specifications include a reference voltage of -1.25V +40mV/-50mV (max), line regulation of ±25mV (max), and load regulation of ±15mV (max).

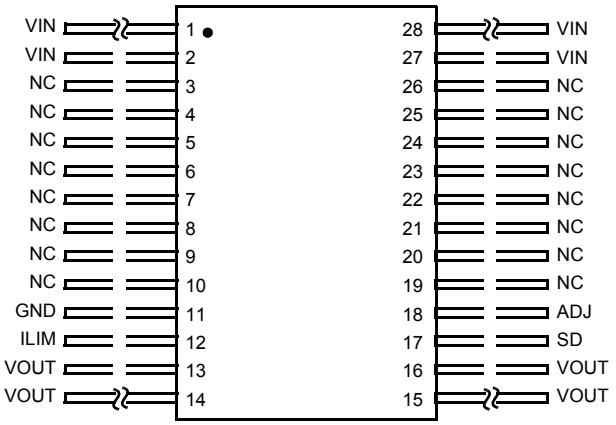
Constructed with the Intersil dielectrically isolated Rad Hard Silicon Gate (RSG) BiCMOS process, these devices are immune to Single Event Latch-up and have been specifically designed to provide highly reliable performance in harsh radiation environments.

Specifications for Rad Hard QML devices are controlled by the Defense Supply Center in Columbus (DSCC). The SMD numbers listed here must be used when ordering.

Detailed Electrical Specifications for these devices are contained in SMD 5962-02503. A 'hotlink' is provided on the Intersil website for downloading.

Pinout

ISL72991RHF (FLATPACK CDFP3-F28)
TOP VIEW



Features

- Electrically Screened to DSCC SMD # 5962-02503
- QML Qualified per MIL-PRF-38535 Requirements
- Radiation Environment
  - Total Dose (Max) . . . . . 300krad(SI)
  - Latch-Up Immune
- Line Regulation . . . . . ±25mV (max)
- Load Regulation . . . . . ±12mV (typ); ±15mV (max)
- Output Voltage Range . . . . . -2.25V to -26V
- Dropout Voltage (100mA). . . . . 0.2V (typ); 0.3V (max)
- Dropout Voltage (1A) . . . . . .1V (max)
- Minimum Load Current. 3.0mA
- TTL Input-Level Shutdown (SD); Low = On

Applications

- Switching Power Supplies
- DC/DC Converters
- Motor Controllers

Ordering Information

ORDERING NUMBER	INTERNAL MKT. NUMBER	TEMP. RANGE (°C)
5962F0250301VXC	ISL72991RHVF	-55 to 125
5962F0250301QXC	ISL72991RHQF	-55 to 125
5962F0250301V9A	ISL72991RHVX	-55 to 125
ISL72991RHF/Proto	ISL72991RHF/Proto	-55 to 125

Application Information

Typical User Application:

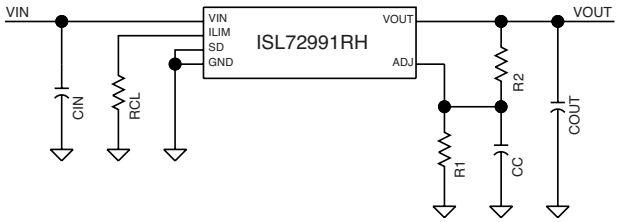


FIGURE 1. TYPICAL APPLICATION SCHEMATIC

Output Voltage Programming

The output voltage of the regulator can be programmed with two external resistors and is described by the following equation: $V_{OUT} = V_{REF}$ x (1+R2/R1) - (I_{ADJ} x R2).

Output Current Limit Programming

The output current limit threshold of the regulator can be programmed with a single external resistor connected from I_{LIM} to ground. The current flowing into the I_{LIM} pin is described by the following equation: $I_{LIM} = 1V/(R_{CL} + 2400)$. The graph below shows the relationship between I_{LIM} and the output current limit threshold, I_{OUT_LIM}.

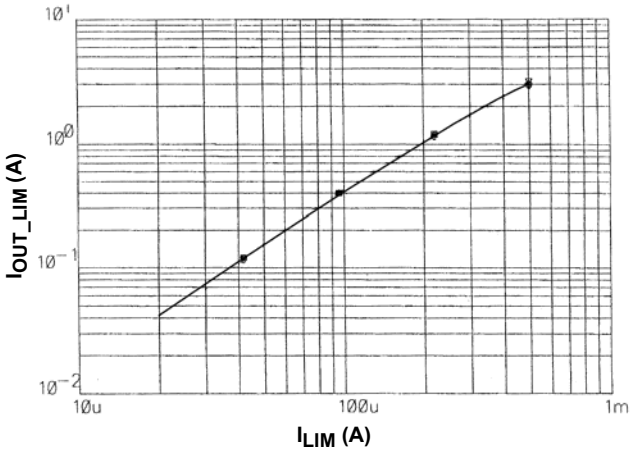


FIGURE 2. I_{OUT_LIM} vs I_{LIM}

Capacitor Selection

An input capacitor is required if the regulator is located more than 6 inches from power supply filter capacitors. A 10µF solid tantalum capacitor is recommended.

An output capacitor of at least 10µF must be used to insure stability of the regulator. Additional capacitance may be added as required to improve the dynamic response of the regulator. Solid tantalum and/or ceramic capacitors are recommended.

Loop Compensation

The output capacitor and ESR comprise a zero in the loop transfer function that must be compensated with a pole to insure loop stability in accordance with the following equation: C_C x R2 = C_{OUT} x ESR. The compensating capacitor should be a low ESR ceramic type.

Layout Guidelines

The stability of the regulator is sensitive to layout. It is strongly recommended that a continuous copper ground plane (1 ounce or greater) be used. In addition, component lead lengths and interconnects should be minimized, but should not exceed 1/2 inch. Finally, the return lead of the compensation capacitor (C_C) should be connected as close as possible to the GND pin of the IC.

Die Characteristics

DIE DIMENSIONS:

5870μm x 5210μm (231.1mils x 205.1mils)
Thickness: 483μm ± 25.4μm (19mils ± 1mil)

INTERFACE MATERIALS:

Glassivation:

Type: PSG (Phosphorous Silicon Glass)
Thickness: 8.0kÅ ± 1.0kÅ

Top Metallization:

Type: AlSiCu
Thickness: 16.0kÅ ± 2kÅ

Substrate:

Radiation Hardened Silicon Gate,
Dielectric Isolation

Backside Finish:

Silicon

ASSEMBLY RELATED INFORMATION:

Substrate Potential:

Unbiased (DI)

ADDITIONAL INFORMATION:

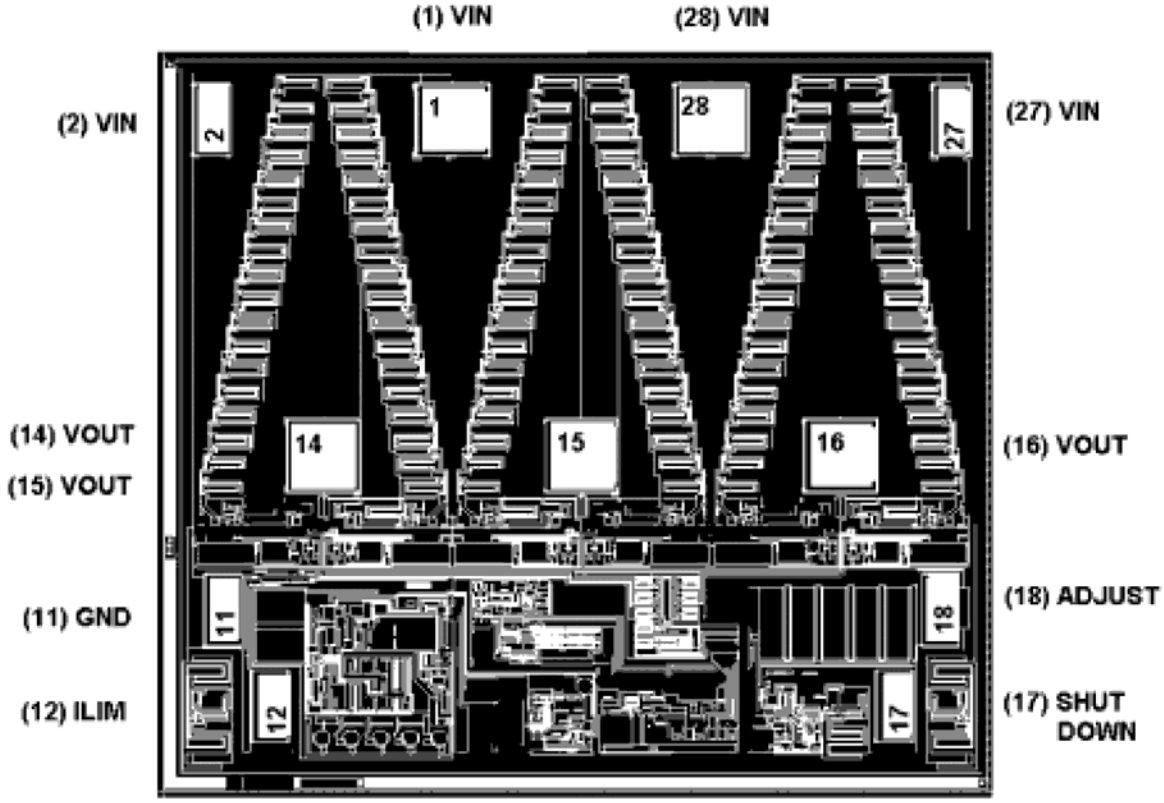
Worst Case Current Density:

$<2.0 \times 10^5$ A/cm^2

Transistor Count:

Metallization Mask Layout

ISL72991RH



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