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SEMICONDUCTOR



# LVD SCSI 27-Line Regulator

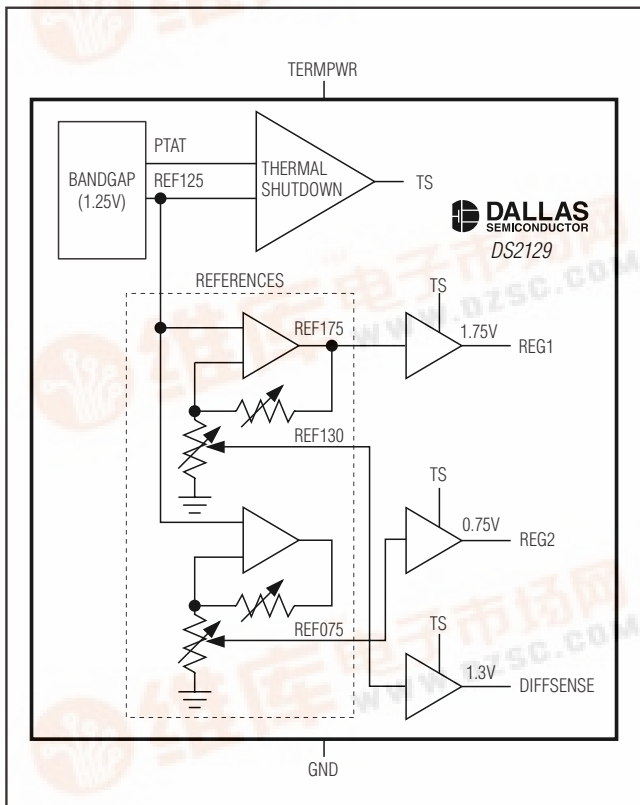
## General Description

The DS2129 is a triple-output voltage regulator for 27-line, low-voltage-differential (LVD) SCSI termination for SPI-2 and SPI-3 applications using LVD termination networks. The device provides reference voltages and bias currents for LVD-termination resistor pi ( $\pi$ ) networks. With a pi network (475 $\Omega$ , 121 $\Omega$ , 475 $\Omega$ ), the DS2129 meets the common-mode bias, differential bias, and termination-impedance requirements of SPI-2 (Ultra2) and SPI-3 (Ultra3). The device also provides a 1.3V output for DIFFSENSE signaling, and includes protection features such as thermal shutdown and active current limiting.

## Applications

SCSI Array Backplane  
SCSI Cables

## Block Diagram



## Features

- ◆ Fully Compliant with SPI-2 and SPI-3
- ◆ 2.7V to 5.25V Operation
- ◆ Differential Fail-Safe Bias

## Ordering Information

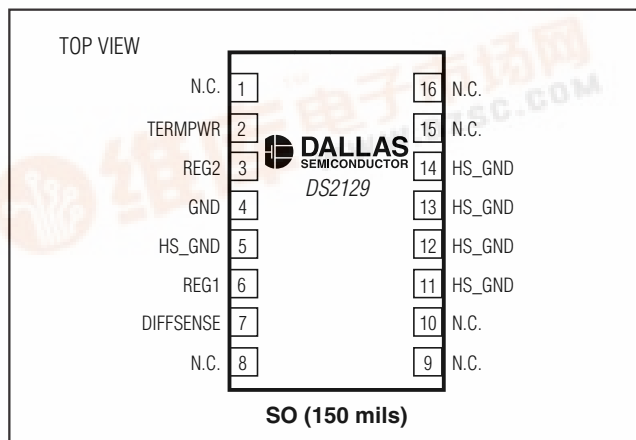
| PART*       | VOLTAGE (V) | PIN-PACKAGE | TOP MARK** |
|-------------|-------------|-------------|------------|
| DS2129S     | 5           | 16 SO       | DS2129     |
| DS2129S+    | 5           | 16 SO       | DS2129     |
| DS2129S/T&R | 5           | 16 SO       | DS2129     |
| DS2129S+T&R | 5           | 16 SO       | DS2129     |

+Denotes lead-free package.

\*All devices rated for the commercial (0°C to +70°C) temperature range.

\*\*A "+" anywhere on the topmark denotes a lead-free package.

## Pin Configuration



DS2129



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**MAXIM**

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## ABSOLUTE MAXIMUM RATINGS

TERMPWR, DIFFSENSE, REG1, REG2 .....-0.3V, +6.0V  
 REG1, REG2 Continuous Output Current .....±200mA  
 Continuous Power Dissipation (T<sub>A</sub> = +70°C)  
 16-Pin SO (derate 13mW/°C above +70°C) .....1W

Operating Temperature Range .....0°C to +70°C  
 Junction Temperature .....+150°C  
 Storage Temperature Range .....-65°C to +150°C  
 Soldering Temperature .....See IPC/JEDEC  
 J-STD-020A Specification

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

## ELECTRICAL CHARACTERISTICS

(TERMPWR = 3.3V, T<sub>A</sub> = 0°C to +70°C, unless otherwise noted.) (Note 1)

| PARAMETER                            | SYMBOL                 | CONDITIONS                           | MIN  | TYP  | MAX  | UNITS |
|--------------------------------------|------------------------|--------------------------------------|------|------|------|-------|
| <b>TERMPWR</b>                       |                        |                                      |      |      |      |       |
| TERMPWR Supply Current               | I <sub>TERM</sub>      | No load                              |      |      | 40   | mA    |
| TERMPWR Voltage                      | V <sub>TERM</sub>      |                                      | 2.7  |      | 5.25 | V     |
| <b>V<sub>REF</sub> REGULATOR</b>     |                        |                                      |      |      |      |       |
| 0.75V Regulator Output Voltage, REG2 | V <sub>075</sub>       | I <sub>OUT</sub> = ±125mA            | 0.7  | 0.75 | 0.8  | V     |
| 0.75V Regulator Source Current, REG2 | I <sub>SRC_075</sub>   | V <sub>OUT</sub> = 0.25V             |      |      | -200 | mA    |
| 0.75V Regulator Sink Current, REG2   | I <sub>SINK_075</sub>  | V <sub>OUT</sub> = 1.25V             | +200 |      |      | mA    |
| 0.75V Regulator Source Current Limit | I <sub>SRCL_075</sub>  | V <sub>OUT</sub> = 0V                | -700 |      |      | mA    |
| 0.75V Regulator Sink Current Limit   | I <sub>SINKL_075</sub> | V <sub>OUT</sub> = 3.3V              |      |      | +700 | mA    |
| 1.75V Regulator Output Voltage, REG1 | V <sub>175</sub>       | I <sub>OUT</sub> = ±125mA            | 1.7  | 1.75 | 1.8  | V     |
| 1.75V Regulator Source Current, REG1 | I <sub>SRC_175</sub>   | V <sub>OUT</sub> = 1.25V             |      |      | -200 | mA    |
| 1.75V Regulator Sink Current, REG1   | I <sub>SINK_175</sub>  | V <sub>OUT</sub> = 2.25V             | +200 |      |      | mA    |
| 1.75V Regulator Source Current Limit | I <sub>SRCL_175</sub>  | V <sub>REF</sub> = 0V                | -700 |      |      | mA    |
| 1.75V Regulator Sink Current Limit   | I <sub>SINKL_175</sub> | V <sub>REF</sub> = 3.3V              |      |      | +700 | mA    |
| <b>DIFFSENSE OUTPUT</b>              |                        |                                      |      |      |      |       |
| DIFFSENSE Driver Output Voltage      | V <sub>DSO</sub>       | -5mA ≤ I <sub>DIFFSENSE</sub> ≤ 50μA | 1.2  | 1.3  | 1.4  | V     |
| DIFFSENSE Driver Source Current      | I <sub>DSH</sub>       | V <sub>DIFFSENSE</sub> = 0V          | -5   |      | -15  | mA    |
| DIFFSENSE Driver Sink Current        | I <sub>DSL</sub>       | V <sub>DIFFSENSE</sub> = 2.4V        | 100  |      | 200  | μA    |

# LVD SCSI 27-Line Regulator

## ELECTRICAL CHARACTERISTICS (continued)

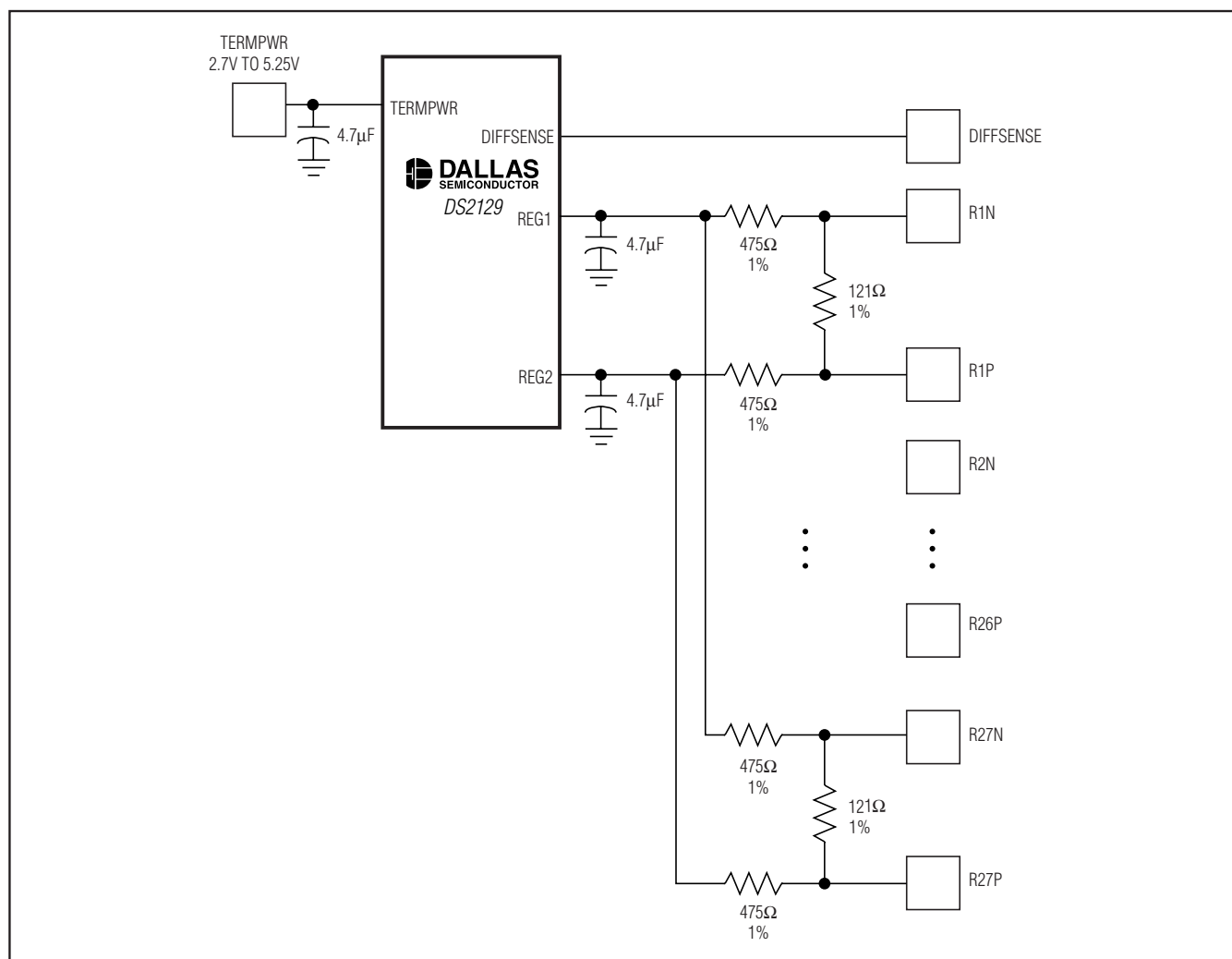
(TEMPWR = 3.3V,  $T_A$  = 0°C to +70°C, unless otherwise noted.) (Note 1)

| PARAMETER                               | SYMBOL | CONDITIONS                 | MIN | TYP  | MAX | UNITS |
|-----------------------------------------|--------|----------------------------|-----|------|-----|-------|
| <b>THERMAL SHUTDOWN</b>                 |        |                            |     |      |     |       |
| Thermal-Shutdown Threshold<br>(Note 2)  |        | For increasing temperature |     | +150 |     | °C    |
| Thermal-Shutdown Hysteresis<br>(Note 2) |        |                            |     | 10   |     | °C    |

**Note 1:** All voltages are referenced to ground.

**Note 2:** Guaranteed by design and not production tested.

## Typical Operating Circuit



# LVD SCSI 27-Line Regulator

## Pin Description

| PIN                       | NAME      | FUNCTION                                                                                           |
|---------------------------|-----------|----------------------------------------------------------------------------------------------------|
| 1, 8, 9,<br>10, 15,<br>16 | N.C.      | No Connection. Do not connect pins.                                                                |
| 2                         | TERMPWR   | Termination Power. Connect to SCSI TERMPWR line and decouple with a 4.7 $\mu$ F ceramic capacitor. |
| 3                         | REG2      | Regulator 2, 0.75V Output. Decouple with a 4.7 $\mu$ F ceramic capacitor.                          |
| 4                         | GND       | Signal Ground                                                                                      |
| 5, 11–14                  | HS_GND    | Heat-Sink Ground. Internally connected to the mounting pad. Should be connected to ground.         |
| 6                         | REG1      | Regulator 1, 1.75V Output. Decouple with a 4.7 $\mu$ F ceramic capacitor.                          |
| 7                         | DIFFSENSE | DIFFSENSE Output. Drives the SCSI bus DIFFSENSE line.                                              |

## Detailed Description

The DS2129 provides three regulated outputs. The REG1 provides a 1.75V output, and the REG2 provides a 0.75V output. Both regulators can sink and source 200mA of current. These regulators are current-limited to less than 700mA. The thermal-shutdown circuit disables the output buffers should the die temperature exceed +150°C. With a pi network of resistors (475 $\Omega$ , 121 $\Omega$ , 475 $\Omega$ ) connected to these two outputs, the DS2129 provides common-mode bias, differential bias, and common impedance and differential impedance, as required in a terminator specified in SPI-2 and SPI-3 standards for a SCSI system. The third regulator provides a 1.3V output for DIFFSENSE signaling.

## Chip Information

TRANSISTOR COUNT: 3778 CMOS and 80 BIPOLAR  
 PROCESS: BiCMOS  
 SUBSTRATE CONNECTED TO GROUND

## Thermal Information

Thermal Resistance (junction-to-ambient):

$$\theta_{JA} = +77^{\circ}\text{C/W}$$

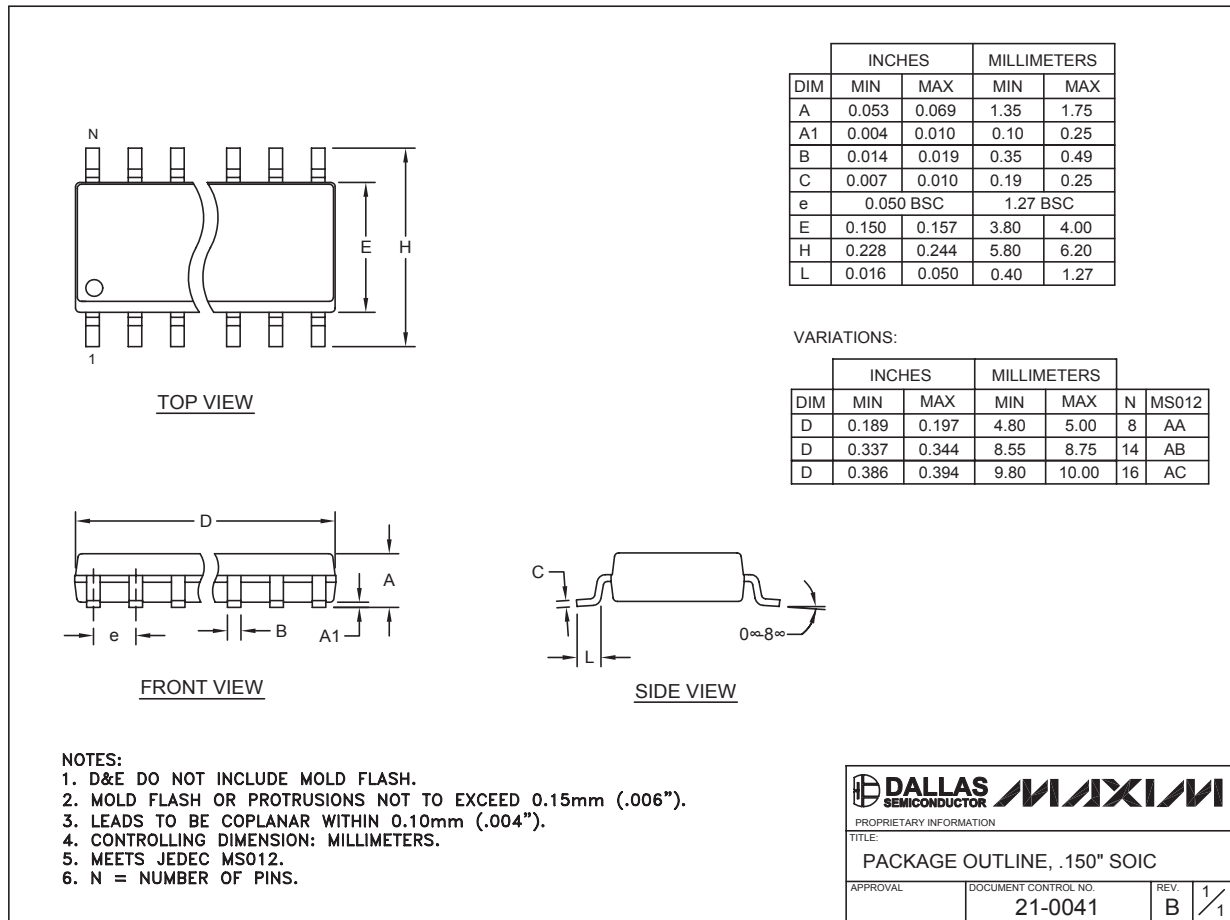
Thermal Resistance (junction-to-case):

$$\theta_{JC} = +25^{\circ}\text{C/W}$$

# LVD SCSI 27-Line Regulator

## Package Information

(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information, go to [www.maxim-integrated.com/packages](http://www.maxim-integrated.com/packages)).



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