

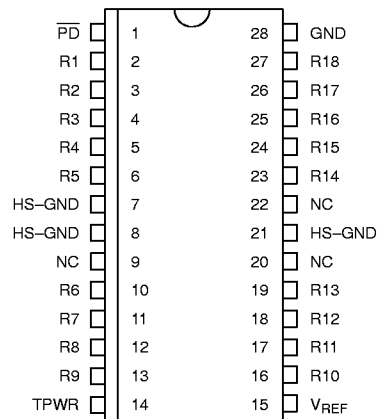
**DALLAS**  
SEMICONDUCTOR

**DS2106**  
SCSI Terminator

## FEATURES

- Fully compliant with SCSI-1, Fast SCSI and Ultra SCSI
- Functionally compatible with DS21S07A
- Provides active termination for 18 signal lines
- 5% tolerance on termination resistors and voltage regulator
- 5% tolerance on termination current
- Low power down capacitance of 3 pF
- Onboard thermal shutdown circuitry
- SCSI bus hot plug compatible
- Fully supports actively negated SCSI signals

## PIN ASSIGNMENT



DS2106S 28-PIN SOIC (300 MIL)

## DESCRIPTION

Fast SCSI and Ultra SCSI require the use of active terminations at both ends of every cable segment in a SCSI system with single-ended drivers and receivers. Ultra SCSI requires support of active negation and hot plugging. The DS2106 is fully compliant with these standards.

The DS2106 integrates a low drop-out regulator and 18 precise switched 110 ohm termination resistors into a 28-pin 300 mil SOIC package.

Active termination provides: greater immunity to voltage drops on the TERMPWR (TERMination PoWeR) line, enhanced high-level noise immunity, intrinsic TERMPWR decoupling, and very low quiescent current consumption. One DS2106 can be used to terminate the Narrow SCSI bus, and a DS21S07A can be used with a DS2106 for termination of a Wide SCSI bus.

**REFERENCE DOCUMENTS**

SCSI-2 (X3.131-1994)

SCSI-3 Parallel Interface (X3T10/855D)

SCSI-3 Fast-20 (X3T10/1071D)

**FUNCTION DESCRIPTION**

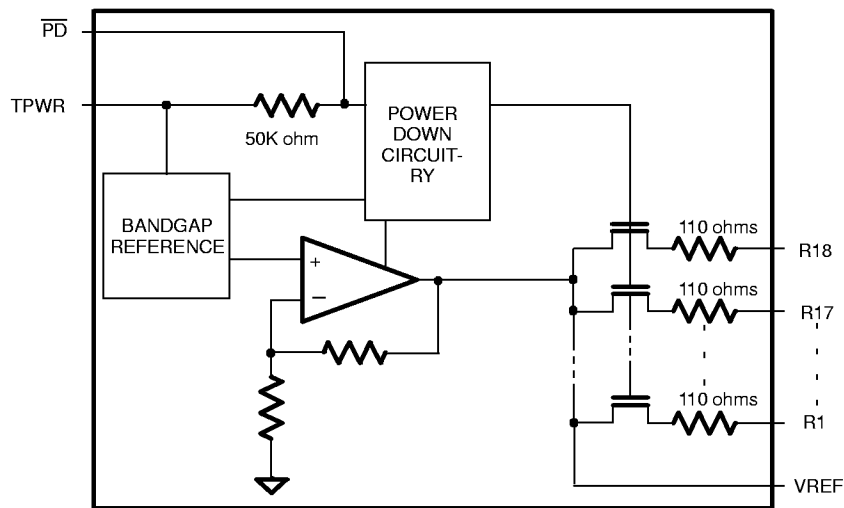
The DS2106 is designed to be a single chip termination subsystem for use in Narrow SCSI systems. The DS2106 consists of a bandgap reference, buffer amplifier, and 18 termination resistors (Figure 1). The voltage regulator circuitry (bandgap reference and class AB power amplifier) produces a precise laser trimmed 2.85 volt level and is capable of sourcing 24 mA into each of the terminating resistors when the signal line is low (active). When the external driver for a given signal line turns off, the active terminator will pull that signal line to 2.85 volts (quiescent state). When used with an active negation driver, the power amp can sink 22 mA per line while keeping the voltage reference in regulation; the terminating resistors maintain their 110 ohm value over the entire voltage range. When all lines settle in the quiescent state, the regulator will consume about 10 mA.

When the DS2106 is put into power-down mode by bringing  $\overline{\text{PD}}$  low, the power-down circuitry will turn off the transistors on each signal line. This will isolate the DS2106 from the signal lines and effectively remove it from the circuit. The power-down pin ( $\overline{\text{PD}}$ ) has an internal 50K $\Omega$  pull-up resistor. To place the DS2106 into an active state, the PD pin should be left open circuited.

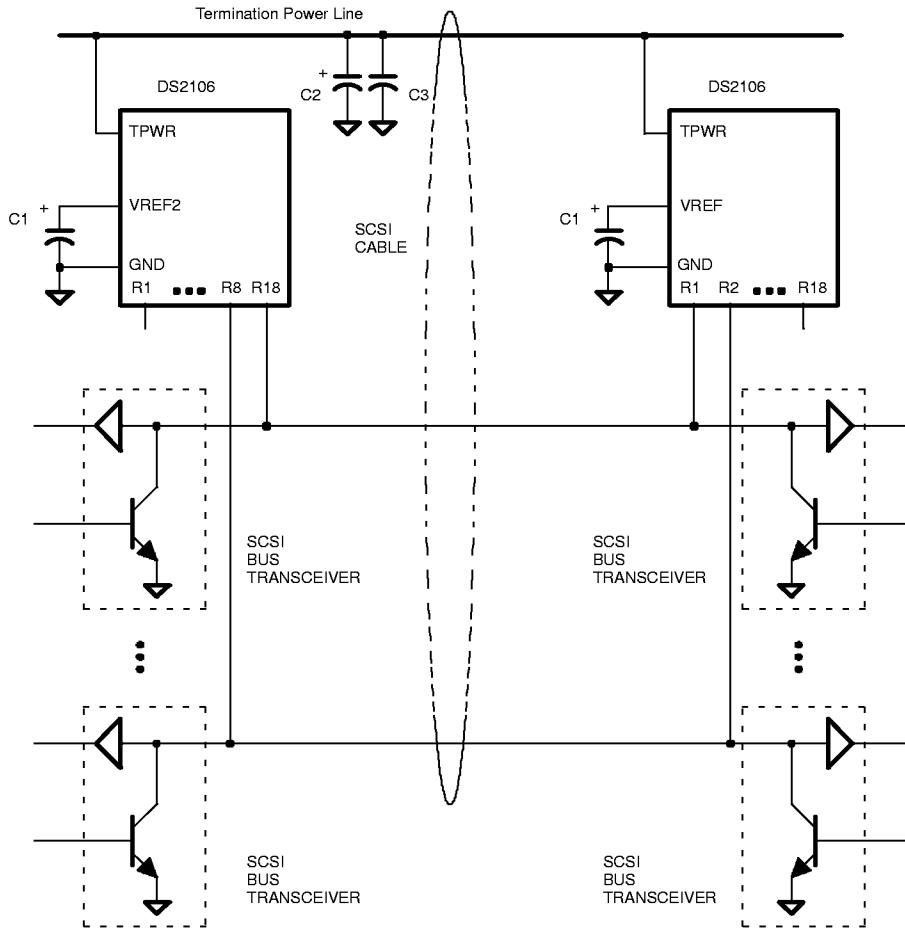
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To ensure proper operation, the TPWR pin should be connected to the SCSI bus TERMPWR line. As with all analog circuitry, the TERMPWR lines should be bypassed locally. A 2.2  $\mu\text{F}$  capacitor and a 0.01  $\mu\text{F}$  high frequency capacitor is recommended between TPWR and ground and placed as close as possible to the DS2106. The DS2106 should be placed as close as possible to the connector to minimize signal and power trace length, thereby resulting in less input capacitance and reflections which can degrade the bus signals.

To maintain the specified regulation, a 4.7  $\mu\text{F}$  capacitor is required between the VREF pin and ground of each DS2106. A high frequency cap (0.1  $\mu\text{F}$  ceramic recommended) can also be placed on the VREF pin in applications that use fast rise/fall time drivers. Figure 2 details a typical SCSI bus configuration. In an 8-bit data SCSI bus (Narrow SCSI), one DS2106 is needed for proper termination of the 18 active signal lines. One DS2106 and one DS21S07A can be used to terminate the 27 active signal lines in a 16-bit data SCSI bus (Wide SCSI).

**DS2106 BLOCK DIAGRAM** Figure 1

TYPICAL SCSI BUS CONFIGURATION Figure 2

**NOTES:**

1. C1 = 4.7  $\mu$ F tantalum  
C2 = 2.2  $\mu$ F tantalum or 4.7  $\mu$ F aluminum  
C3 = 0.01  $\mu$ F ceramic
2. If the DS2106 is to be embedded into a peripheral that will act as a target on a SCSI bus, it is recommended that TERMPWR be derived from the SCSI cable, not generated locally. In this configuration, if a power failure occurs in the peripheral, it will not affect the bus.
3. A high frequency bypass capacitor (0.1  $\mu$ F recommended) can be added in parallel to C1 for applications using fast rise/fall time drivers.

**PIN DESCRIPTION** Table 1

| PIN                      | SYMBOL                 | DESCRIPTION  |
|--------------------------|------------------------|--|
| 1                        | $\overline{\text{PD}}$ | <b>Power Down.</b> When tied low, the DS2106 enters power-down mode. Contains an internal 50K $\Omega$ pull-up. Strap low to deactivate the DS2106, leave open circuited to activate the DS2106. |
| 2-6, 10-13, 16-19, 23-27 | R1...R13<br>R14...R18  | <b>Signal Termination 1.</b> 110 Ohm termination. Connect to SCSI bus signal lines.  |
| 7, 8, 21                 | HS-GND                 | <b>Heat Sink Ground.</b> Internally connected to the mounting pad. Should be either grounded or electrically isolated from other circuitry.  |
| 14                       | TPWR                   | <b>Termination Power.</b> Connect to the SCSI TERMPWR line. Bypass with a 2.2 $\mu\text{F}$ cap.   |
| 15                       | VREF                   | <b>Reference Voltage.</b> 2.85 volt reference; must be decoupled with a 4.7 $\mu\text{F}$ capacitor.   |
| 28                       | GND                    | <b>Ground.</b> Signal ground; 0.0 volts.   |
| 9, 20, 22                | NC                     | <b>No Connect.</b> Do not connect to these pins.   |

**ABSOLUTE MAXIMUM RATINGS\***

|                                       |                      |
|---------------------------------------|----------------------|
| Voltage on Any Pin Relative to Ground | -1.0V to +7.0V       |
| Operating Temperature                 | 0°C to 70°C          |
| Storage Temperature                   | -55°C to +125°C      |
| Soldering Temperature                 | 260°C for 10 seconds |

\* This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operation sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods of time may affect reliability.

**RECOMMENDED OPERATING CONDITIONS**

(0°C to 70°C)

| PARAMETER                | SYMBOL    | MIN  | TYP | MAX            | UNITS | NOTES |
|--------------------------|-----------|------|-----|----------------|-------|-------|
| TERMPWR Voltage          | $V_{TP}$  | 4.00 |     | 5.25           | V     |       |
| $\overline{PD}$ Active   | $V_{PDA}$ | -0.3 |     | 0.8            | V     |       |
| $\overline{PD}$ Inactive | $V_{PDI}$ | 2.0  |     | $V_{TP} + 0.3$ | V     |       |

**DC CHARACTERISTICS**

(0°C to 70°C)

| PARAMETER                          | SYMBOL               | MIN  | TYP | MAX       | UNITS   | NOTES        |
|------------------------------------|----------------------|------|-----|-----------|---------|--------------|
| TERMPWR Current                    | $I_{TP}$<br>$I_{TP}$ |      | 10  | 500<br>14 | mA      | 1, 3<br>1, 4 |
| Power Down Current                 | $I_{PD}$             |      | 500 |           | $\mu$ A | 1, 2, 5      |
| Termination Resistance             | $R_{TERM}$           | 110  |     | 118       | ohm     | 1, 2         |
| Die Thermal Shutdown               | $T_{SD}$             |      | 150 |           | °C      | 1            |
| Power Down Termination Capacitance | $C_{PD}$             |      | 3.0 | 5.0       | pF      | 1, 2, 5, 6   |
| Input Leakage High                 | $I_{IH}$             | -1.0 |     |           | $\mu$ A | 1            |
| Input Leakage Low                  | $I_{IL}$             |      |     | 1.0       | $\mu$ A | 1, 8         |

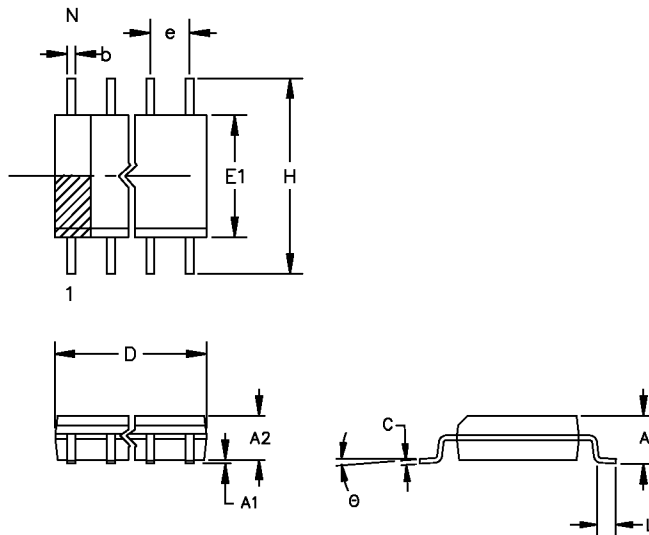
**REGULATOR CHARACTERISTICS**

(0°C to 70°C)

| PARAMETER        | SYMBOL     | MIN  | TYP  | MAX  | UNITS | NOTES |
|------------------|------------|------|------|------|-------|-------|
| Output Voltage   | $V_{REF}$  | 2.7  | 2.85 | 3.0  | V     | 1, 2  |
| Drop Out Voltage | $V_{DROP}$ |      | 0.75 | 1.0  | V     | 3, 6  |
| Output Current   | $I_{OUT}$  | 21.6 | 22.8 | 24.0 | mA    | 9     |
| Line Regulation  | $L_{REG}$  |      | 1.0  | 2.0  | %     | 1, 4  |
| Load Regulation  | $L_{OREG}$ |      | 1.3  | 3.0  | %     | 1, 2  |
| Current Limit    | $I_L$      |      | 700  |      | mA    | 1     |
| Sink Current     | $I_{SINK}$ |      | 400  |      | mA    | 1     |

**NOTES:**

1.  $4.00V < \text{TERMPWR} < 5.50V$ .
2.  $0.0V < \text{signal lines} < \text{TERMPWR}$ .
3. All signal lines =  $0.0V$ .
4. All signal lines open.
5. Power down enabled;  $\overline{\text{PD}} = 0.0V$ .
6. Guaranteed by design; not production tested.
7.  $R_1$  through  $R_{18}$  only.
8.  $R_1$  through  $R_{18}$  and  $\overline{\text{PD}}$ .
9.  $V_{\text{SIGNAL}} = 0.2V$ .

**28-PIN SOIC (300 MIL)**

The chamfer on the body is optional. If it is not present, a terminal 1 identifier must be positioned so that 1/2 or more of its area is contained in the hatched zone.

| PKG    | 28-PIN    |       |
|--------|-----------|-------|
|        | DIM       | MIN   |
| A IN.  | 0.094     | 0.105 |
| MM     | 2.39      | 2.67  |
| A1 IN. | 0.004     | 0.012 |
| MM     | 0.102     | 0.30  |
| A2 IN. | 0.089     | 0.095 |
| MM     | 2.26      | 2.41  |
| b IN.  | 0.013     | 0.020 |
| MM     | 0.33      | 0.51  |
| C IN.  | 0.009     | 0.013 |
| MM     | 0.229     | 0.33  |
| D IN.  | 0.698     | 0.712 |
| MM     | 17.73     | 18.08 |
| e IN.  | 0.050 BSC |       |
| MM     | 1.27 BSC  |       |
| E1 IN. | 0.290     | 0.300 |
| MM     | 7.37      | 7.62  |
| H IN.  | 0.398     | 0.416 |
| MM     | 10.11     | 10.57 |
| L IN.  | 0.016     | 0.040 |
| MM     | 0.40      | 1.02  |
| ⊖      | 0°        | 8°    |