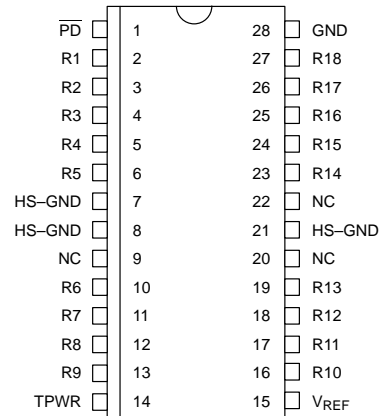# DALLAS
SEMICONDUCTOR

DS21T06
SCSI Terminator

FEATURES

- Fully compliant with SCSI–1, Fast SCSI and Ultra SCSI

- Functional drop in replacement for the DS2106

- Complimentary part to DS21T07 for wide SCSI

- 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

$\overline{PD}$	1	28	GND
R1	2	27	R18
R2	3	26	R17
R3	4	25	R16
R4	5	24	R15
R5	6	23	R14
HS–GND	7	22	NC
HS–GND	8	21	HS–GND
NC	9	20	NC
R6	10	19	R13
R7	11	18	R12
R8	12	17	R11
R9	13	16	R10
TPWR	14	15	V_{REF}

DS21T06S 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 DS21T06 is fully compliant with these standards.

The DS21T06 integrates a low dropout regulator and 18 precise switched 10 Ω 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 DS21T06 can be used to terminate the Narrow SCSI bus, or a DS21T07 can be used with a DS21T06 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)

Available from: Global Engineering Documents
15 Inverness Way East
Englewood, CO 80112–5704
Phone: (800) 854–7179,(303) 792–2181
Fax: (303) 792–2192

FUNCTION DESCRIPTION
The DS21T06 is designed to be a single chip termination subsystem for use in Narrow SCSI systems. The DS21T06 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 25 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 Ω value over the entire voltage range. When all lines settle in the quiescent state, the regulator will consume about 10 mA.

When the DS21T06 is put into power–down mode by bringing $\overline{PD}$ low, the power–down circuitry will turn off the transistors on each signal line. This will isolate the DS21T06 from the signal lines and effectively remove it from the circuit. The power–down pin ($\overline{PD}$) has an internal 50KΩ pull–up resistor. To place the DS21T06 into an active state, the $\overline{PD}$ pin should be tied higher left open circuited.

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 μF capacitor and a 0.01 μF high frequency capacitor is recommended between TPWR and ground and placed as close as possible to the DS21T06. The DS21T06 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 μF capacitor is required between the VREF pin and ground of each DS21T06. A high frequency cap (0.1 μF 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 DS21T06 is needed for proper termination of the 18 active signal lines. One DS21T06 and one DS21T07 can be used to terminate the 27 active signal lines in a 16–bit data SCSI bus (Wide SCSI).

DS21T06 BLOCK DIAGRAM Figure 1
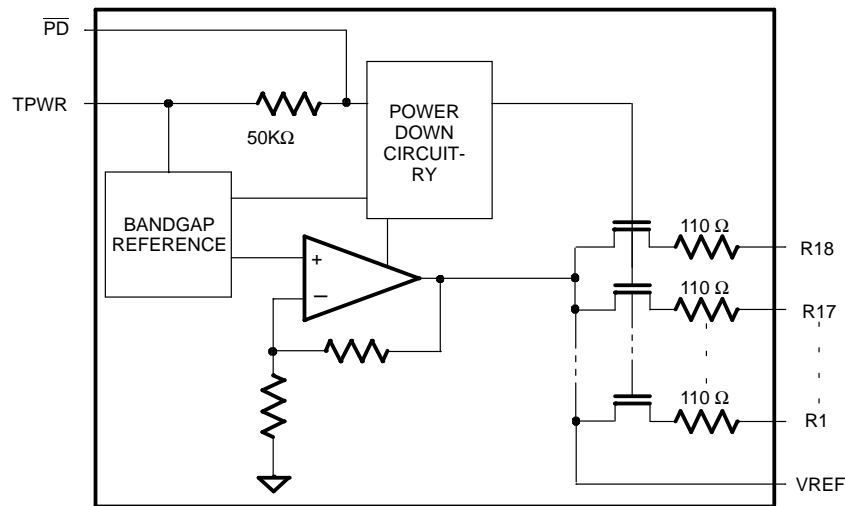
TYPICAL SCSI BUS CONFIGURATION Figure 2
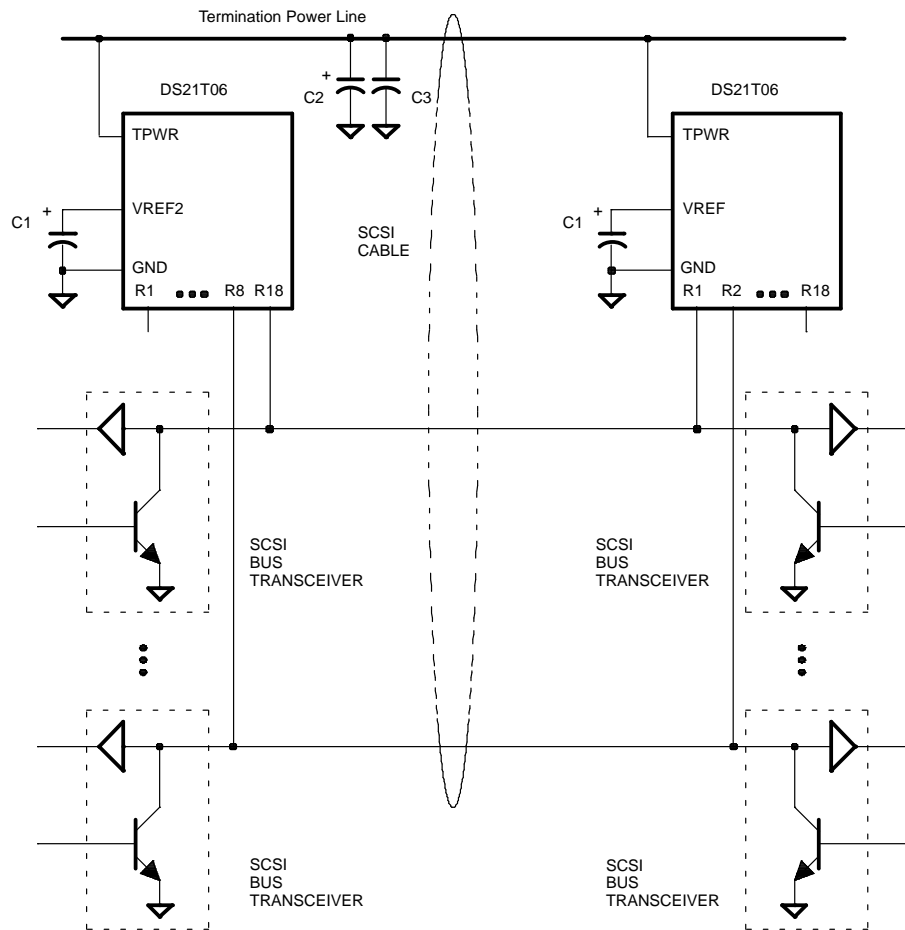
NOTES:

1. C1 = 4.7 μF tantalum
    C2 = 2.2 μF tantalum or 4.7 μF aluminum
    C3 = 0.01 μF ceramic

2. If the DS21T06 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 μF recommended) can be added in parallel to C1 for applications using fast rise/fall time drivers.

PIN DESCRIPTION Table 1

PIN	SYMBOL	DESCRIPTION
1	$\overline{PD}$	**Power Down.** When tied low, the DS21T06 enters power–down mode. Contains an internal 50KΩ pull–up. Tie low to deactivate the DS21T06. Tie high or leave open circuited to activate the DS21T06.
2 –6, 10 – 13, 16 – 19, 23 – 27	R1...R13 R14...R18	**Signal Termination 1.** 110 Ω termination. Connect to SCSI bus signal lines.
7 – 9, 20 – 22	HS–GND	**Heat Sink Ground.** Internally connected to the mounting pad. Should be either grounded or electrically isolated from other circuitry.
14	TPWR	**Termination Power.** Connect to the SCSI TERMPWR line. Bypass with a 2.2 µF cap.
15	VREF	**Reference Voltage.** 2.85 volt reference; must be decoupled with a 4.7 µF capacitor.
28	GND	**Ground.** Signal ground; 0.0 volts.

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.

The Dallas Semiconductor DS21T06 is built to the highest quality standards and manufactured for long term reliability. All Dallas Semiconductor devices are made using the same quality materials and manufacturing methods. However, the DS21T06 is not exposed to environmental stresses, such as burn–in, that some industrial applications require. For specific reliability information on this product, please contact the factory in Dallas at (972) 371–4448.

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} I_{TP}		10	500 14	mA	1, 3 1, 4
Power Down Current	I_{PD}		500		μA	1, 2, 5
Termination Resistance	R_{TERM}	107.5	110	119.5	Ω	1, 2
Die Thermal Shutdown	TS_D		150		°C	1
Power Down Termination Capacitance	C_{PD}		3.0	3.5	pF	1, 2, 5, 6
Input Leakage High	I_{IH}	−1.0			μA	1
Input Leakage Low	I_{IL}			1.0	μA	1, 7

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}			25.2	mA	9
Line Regulation	LI_{REG}		1.0	2.0	%	1, 4
Load Regulation	LO_{REG}		1.3	3.0	%	1, 2
Current Limit	I_L		700		mA	1
Sink Current	I_{SINK}		400		mA	1

NOTES:

1. 4.00V < TERMPWR < 5.50V.

2. 0.0V < signal lines < TERMPWR.

3. All signal lines = 0.0V.

4. All signal lines open.

5. Power down enabled; $\overline{PD}$ = 0.0V.

6. Guaranteed by design; not production tested.

7. V_{SIGNAL} = 0.2V.

28–PIN SOIC (300 MIL)
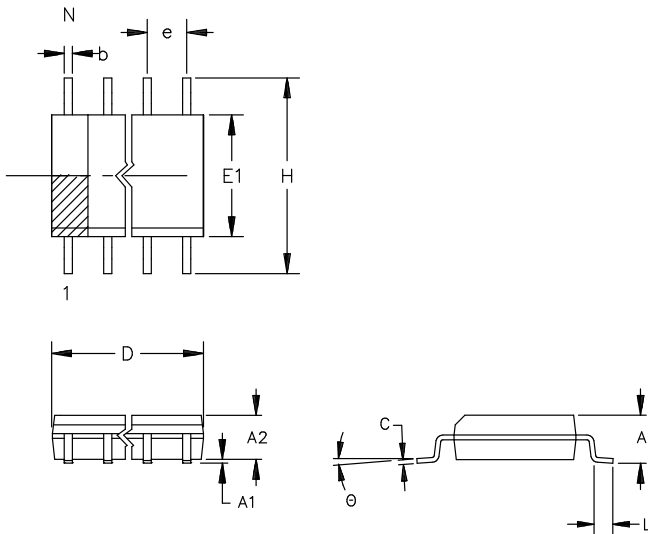
The chamfer on the body is optional. If it is not present, a terminal 1 identifier must be positioned so that 1/2 or more of its area is contained in the hatched zone.

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