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9-Bit Switchable Active SCSI-2 Bus Terminator (110Ω) With Voltage Regulator

The MCCS142237™ is a precision 9-bit switchable active SCSI-2 bus terminator with an on-board 2.85V regulator. The SCSI-2 standard recommends the use of active terminations at both ends of every cable segment in a SCSI system with single-ended drivers and receivers. The MCCS142237 enables the designer to gain the benefits of active termination: greater immunity to voltage drops on the TERMPWR (TERMination PoWeR) line, enhanced high-level immunity, intrinsic TERMPWR decoupling, and very low quiescent current consumption. When the device is enabled (PD = HIGH), the MCCS142237 provides 110Ω precision resistor pull-ups to a 2.85V reference for termination of 9-bits in a SCSI-2 standard bus system interface. When PD is LOW, the device is in the High Impedance State on all 9 bits.

- Complies With SCSI and SCSI-2 Standards
- Pin Compatible With DS2107, DS2107A and DS21S07A
- 9 Switchable 110Ω Terminating Resistors
- Power-Down Mode Disengages Terminating Resistors
- Built-In 2.85V Regulator
- Guaranteed Maximum 1.0V Dropout Voltage
- 3pF Channel Capacitance During "Power-Down"
- Thermal Shutdown Circuitry
- Fully Supports Active Negation SCSI Signals
- Regulator Short Circuit Protection
- Thin Profile 20-Pin TSSOP and 16-Pin SOIC Packages

The regulator has a dropout voltage of less than 1.0V, allowing regulation of input voltages less than 4.0V. Internal protective features include thermal shutdown.

The regulator produces a 2.85V level and is capable of sourcing 24mA into each of the termination resistors when the signal line is low (asserted). When the driver for a given signal line turns off, the terminator will pull the signal line to 2.85V (quiescent state). To handle actively negated SCSI signals, the regulator can sink over 220mA. When the Power-Down pin (PD) is LOW, the power-down circuitry will turn off the transistors on each signal line. This isolates the MCCS142237 from the signal lines and effectively removes it from the bus. The PD pin has an internal pull-up resistor. To place the terminator into the active state, the PD pin should either be left open circuited or tied HIGH.


To ensure proper operation, both the TERMPWR1 and TERMPWR2 pins must be connected to the SCSI bus TERMPWR line and both the VREF1 and VREF2 pins must be tied together externally. Each MCCS142237 requires a minimum 2.2μF capacitor connected between the VREF pins and ground.

In 8-bit SCSI applications ("A" cable), two MCCS142237s are needed at each end of the SCSI cable in order to terminate the 18 active signal lines. In 16-bit WIDE SCSI applications ("P" cable), three MCCS142237s would be needed at each end of the SCSI cable in order to terminate the 27 active signal lines.


For information on "Power Dissipation for Active SCSI Terminators," refer to Motorola Application Note AN1408/D, available through the Motorola Design-NET Fax System, or through the Motorola Literature Distribution Center.

MCCS142237

**9-BIT SWITCHABLE
ACTIVE SCSI-2
BUS TERMINATOR**



DW SUFFIX
16-LEAD WIDE SOIC PACKAGE
CASE 751G-02



DT SUFFIX
20-LEAD PLASTIC TSSOP PACKAGE
CASE 948D-03

TRUTH TABLE

PD	Output
0	Z
1	Terminated

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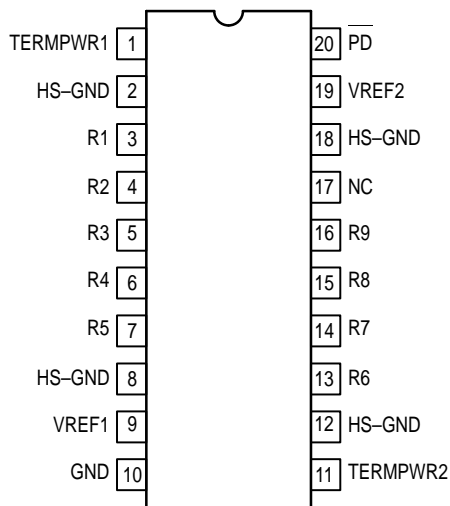


Figure 1. 20-Lead Pinout (Top View)

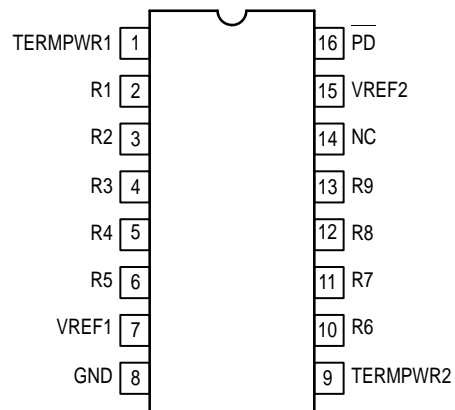


Figure 2. 16-Lead Pinout (Top View)

PIN DESCRIPTIONS

Symbol	20-Lead TSSOP	16-Lead SOIC	Description
TERMPWR1	1	1	Termination Power 1. Connect to the SCSI TERMPWR line. See Figure 4.
R1	3	2	Signal Termination 1. 110 ohm termination.
R2	4	3	Signal Termination 2. 110 ohm termination.
R3	5	4	Signal Termination 3. 110 ohm termination.
R4	6	5	Signal Termination 4. 110 ohm termination.
R5	7	6	Signal Termination 5. 110 ohm termination.
VREF1	9	7	Reference Voltage 1. Must be externally connected directly to the VREF2 pin. See Figure 4.
GND	10	8	Ground. Signal ground; 0.0V.
TERMPWR2	11	9	Termination Power 2. Should be connected to the SCSI TERMPWR line. See Figure 4.
R6	13	10	Signal Termination 6. 110 ohm termination.
R7	14	11	Signal Termination 7. 110 ohm termination.
R8	15	12	Signal Termination 8. 110 ohm termination.
R9	16	13	Signal Termination 9. 110 ohm termination.
NC	17	14	No Connect. Do not connect any signal to this pin.
VREF2	19	15	Reference Voltage 2. Must be externally connected directly to the VREF1 pin. See Figure 4.
PD	20	16	Power Down. When tied low, the MCCS142237 enters power-down mode. Contains an internal 50kΩ pull-up. Tie low to de-activate the MCCS142237, leave open circuited or tie high to activate the MCCS142237.
HS-GND	2,8,12,18	N/A	Heat Sink Ground.

PD Input Application	Result
A. No Connection to PD	PD input will be pulled “HIGH” internally. This connects the termination resistors.
B. Single Pole Switch to GND	PD input will be pulled “HIGH” internally when the switch is open, which connects the termination resistors. PD input will be held “LOW” when the switch is closed, disconnecting the termination resistors and turning off the voltage regulator.
C. Hardwired “High”	The MCCS142237 will be permanently connected and provide termination on all outputs.
D. Hardwired “Low”	The MCCS142237 will be permanently disconnected.

MAXIMUM RATINGS*

Symbol	Parameter	Value	Unit
TERMPWR	DC Supply Voltage	7.0	V
V _{Line}	Voltage on Any Pin Relative to Ground	-1.0 to +7.0	V
I _{Reg}	Regulator Output Current	0.5	A
t _{stg}	Storage Temperature Range	-65 to +150	°C
V _{REF}	Reference Voltage	5.0	V

* Maximum Ratings are those values beyond which damage to the device may occur. Functional operation should be restricted to the Recommended Operating Conditions.

RECOMMENDED OPERATING CONDITIONS (0° to 70°C)

Symbol	Parameter	Min	Max	Unit
V _{TP}	TERMPWR Voltage	3.9	5.25	V
V _{PDA}	PD Active		0.8	V
V _{PDI}	PD Inactive	2.0	V _{TP} + 0.3	V
V _{Line}	Signal Line Voltage	0	3.0	V
T _A	Operating Temperature Range	0	70	°C

DC CHARACTERISTICS (0° to 70°C)

Symbol	Characteristic	Min	Typ	Max	Unit	Condition
I _{TP}	TERMPWR Current		5	250 10	mA	4V < TERMPWR < 5.25V (Note 1.) 4V < TERMPWR < 5.25V (Note 2.)
I _{PD}	Power-Down Current		100		μA	4V < TERMPWR < 5.25V (Note 4.)
R _{TERM}	Termination Resistance	104.5	110	115.5	Ω	4V < TERMPWR < 5.25V
T _{SD}	Die Thermal Shutdown		150		°C	4V < TERMPWR < 5.25V
C _{PD}	Power-Down Termination Capacitance		3	4.5	pF	4V < TERMPWR < 5.25V (Notes 3., 4.)
H _{PD}	PD Hysteresis		280		mV	4V < TERMPWR < 5.25V
I _{IH}	Input Leakage HIGH	-1.0			μA	4V < TERMPWR < 5.25V (Notes 4., 5.)
I _{IL}	Input Leakage LOW			1.0	μA	4V < TERMPWR < 5.25V (Notes 4., 5.)

1. All signal lines = 0.0V
2. All signal lines open
3. Guaranteed by characterization; not production tested

4. PD = 0.0V
5. Resistors Only

REGULATOR CHARACTERISTICS (0° to 70°C)

Symbol	Characteristic	Min	Typ	Max	Unit	Condition
V _{REF}	Reference Voltage	2.79	2.85	2.91	V	4V < TERMPWR < 5.25V (Notes 6., 8.)
V _{DROP}	Drop Out Voltage		0.75	1.00	V	Notes 6., 7.
L _{IReg}	Line Regulation		<1.0	2.0	%	4V < TERMPWR < 5.25V (Note 8.)
L _{OReg}	Load Regulation		<1.0	3.0	%	4V < TERMPWR < 5.25V
I _{Lim}	Current Limit	-300	-350	-400	mA	4V < TERMPWR < 5.25V (Note 9.)
I _{Sink}	Sink Current	220	300	400	mA	4V < TERMPWR < 5.25V (Note 10.)

6. All signal lines = 0.0V
7. Guaranteed by design; not production tested
8. All signal lines open

9. V_{REF} pins = 0V
10. V_{REF} pins = 3.5V

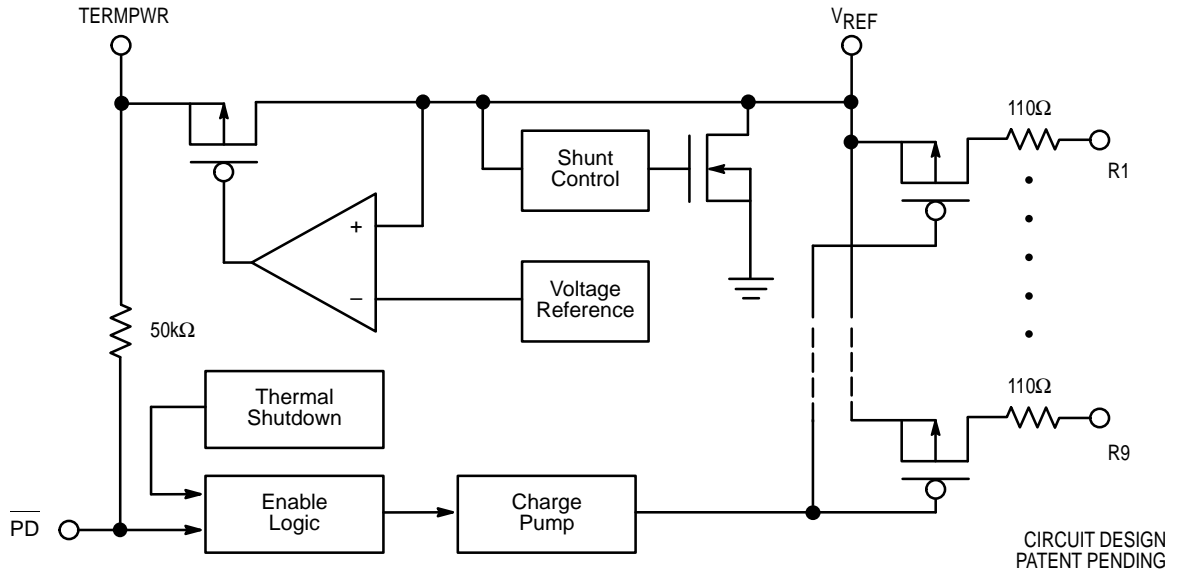


Figure 3. MCCS142237 Block Diagram

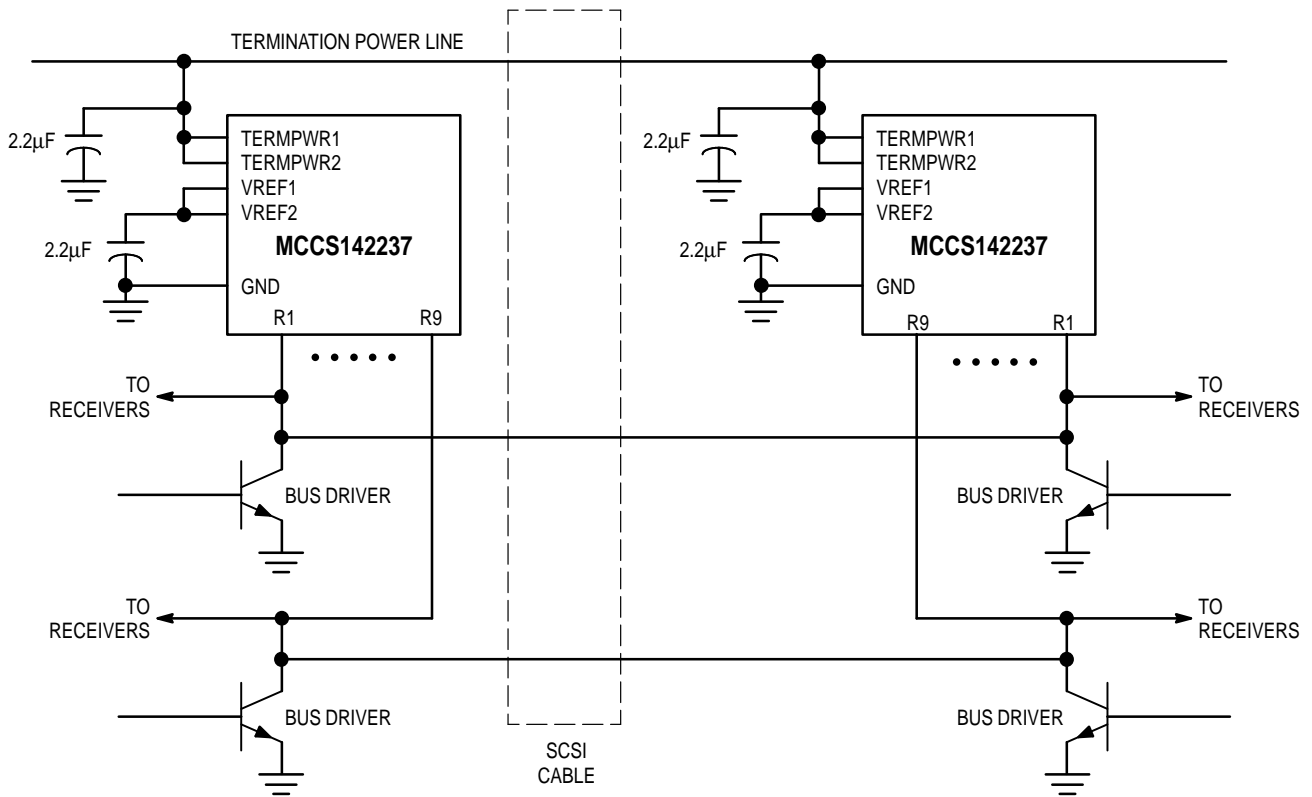


Figure 4. Typical SCSI Bus Configuration Using the MCCS142237

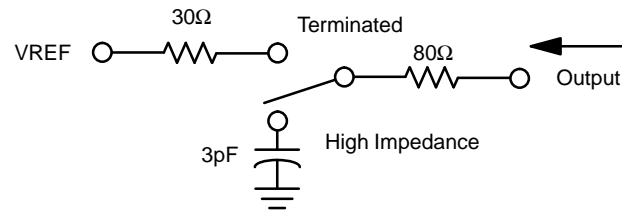


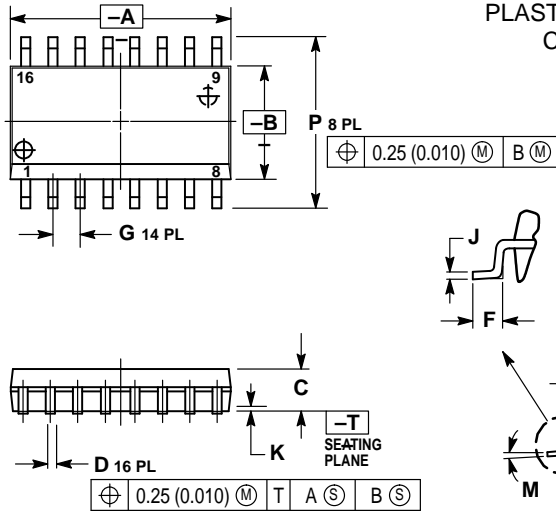
Figure 5. Output Impedance Model

AC CHARACTERISTICS ($V_{REF} = 2.85$, $C_L = 50\text{pF}$, $t_r = t_f = 6\text{ns}$)

Symbol	Parameters	0°C to +70°C	Unit	Condition
$t_{(\text{connect})}$	Max Enable Time, High Impedance to Termination, PD to Outputs	100	μs	Per Truth Table
$t_{(\text{disconnect})}$	Max Disable Time, Termination to High Impedance, PD to Outputs	20	μs	Per Truth Table

OUTLINE DIMENSIONS

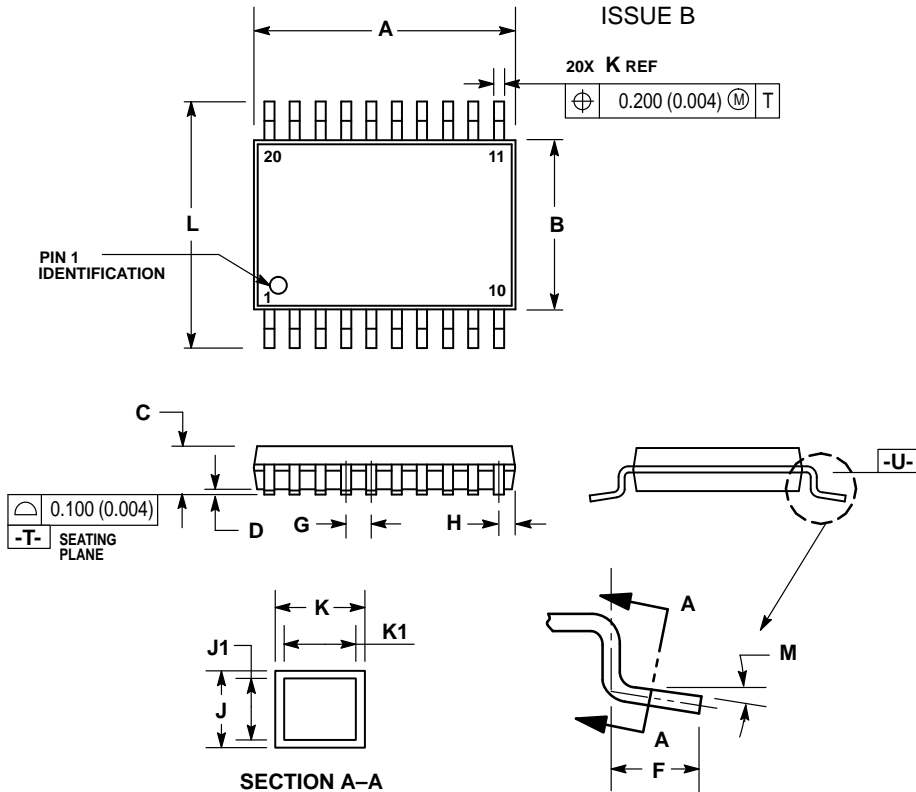
DW SUFFIX
PLASTIC SOIC PACKAGE
CASE 751G-02
ISSUE A



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: MILLIMETER.
 3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
 4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
 5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.13 (0.005) TOTAL IN EXCESS OF D DIMENSION AT MAXIMUM MATERIAL CONDITION.


DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	10.15	10.45	0.400	0.411
B	7.40	7.60	0.292	0.299
C	2.35	2.65	0.093	0.104
D	0.35	0.49	0.014	0.019
F	0.50	0.90	0.020	0.035
G	1.27 BSC		0.050 BSC	
J	0.25	0.32	0.010	0.012
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	10.05	10.55	0.395	0.415
R	0.25	0.75	0.010	0.029

DT SUFFIX
PLASTIC TSSOP PACKAGE
CASE 948D-03
ISSUE B



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: MILLIMETER.
 3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
 4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
 5. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
 6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
 7. DIMENSIONS A AND B ARE TO BE DETERMINED AT DATUM PLANE -U-.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	—	6.60	—	0.260
B	4.30	4.50	0.169	0.177
C	—	1.20	—	0.047
D	0.05	0.25	0.002	0.010
F	0.45	0.55	0.018	0.022
G	0.65 BSC		0.026 BSC	
H	0.275	0.375	0.011	0.015
J	0.09	0.24	0.004	0.009
J1	0.09	0.18	0.004	0.007
K	0.16	0.32	0.006	0.013
K1	0.16	0.26	0.006	0.010
L	6.30	6.50	0.248	0.256
M	0°	10°	0°	10°

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