



TDA8139/D

Double (5.1V and Adjustable) Voltage Regulator with Reset and Disable Functions

PRELIMINARY DATA

FEATURES

- Input Voltage Range: 7 V to 18 V
- Output Currents up to 750 mA
- Fixed Precision Output 1 Voltage: 5.1 V $\pm 2\%$
- Adjustable Output 2 Voltage: 2.8 to 16 V
- Output 1 with Reset Function
- Output 2 with Disable Function by TTL Input
- Short-Circuit Protection at both Outputs
- Thermal Protection
- Low Dropout Voltage

DESCRIPTION

The TDA8139 and the TDA8139D are monolithic dual positive voltage regulators designed to provide a fixed precision output voltage of 5.1 V and an adjustable voltage between 2.8 and 16 V for currents up to 750 mA.

An internal reset circuit generates a reset pulse when the voltage of OUTPUT1 drops below the regulated voltage value.

OUTPUT2 can be disabled via the TTL input.

Short-circuit and thermal protections are included in all versions.

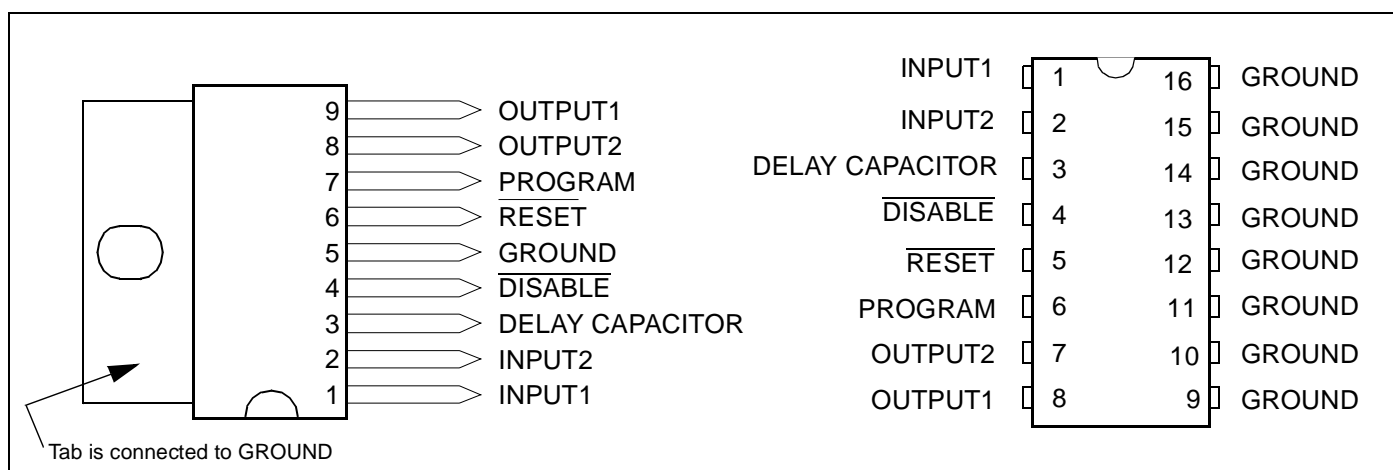
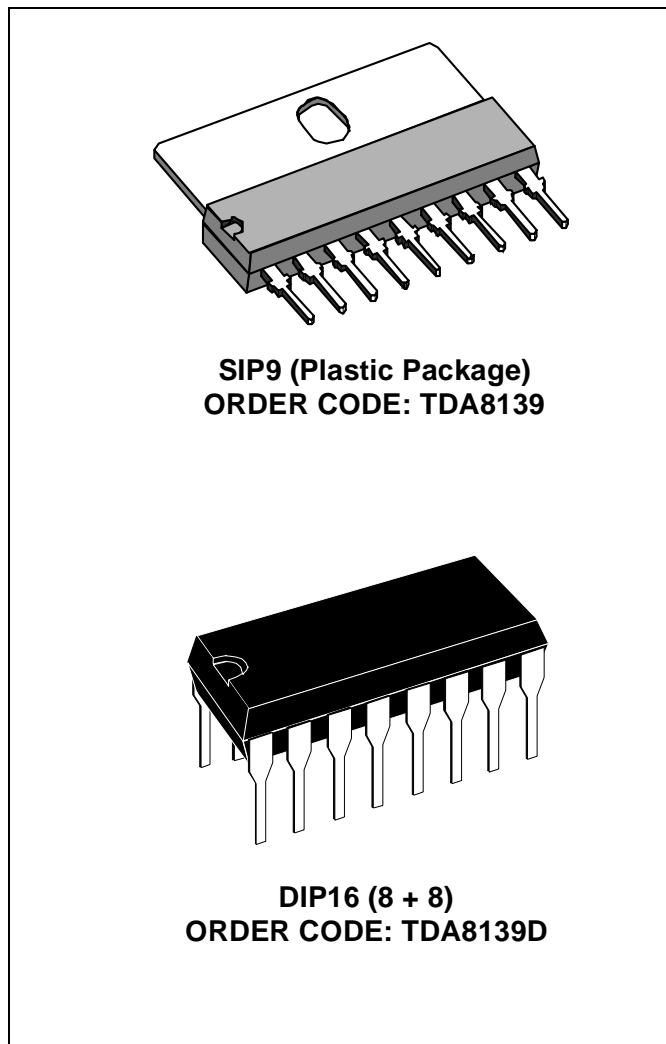


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1 GENERAL INFORMATION

Figure 1: TDA8139 Block Diagram

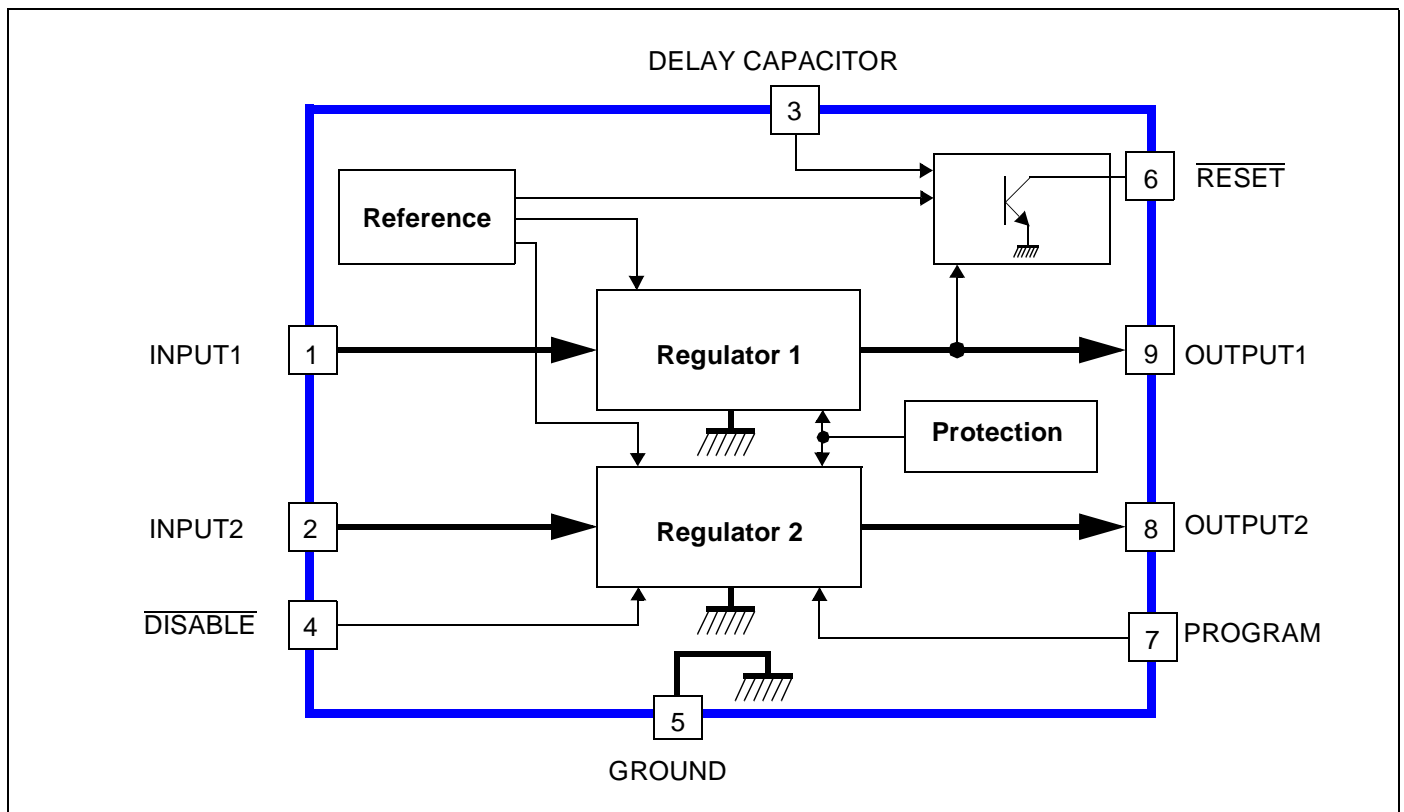
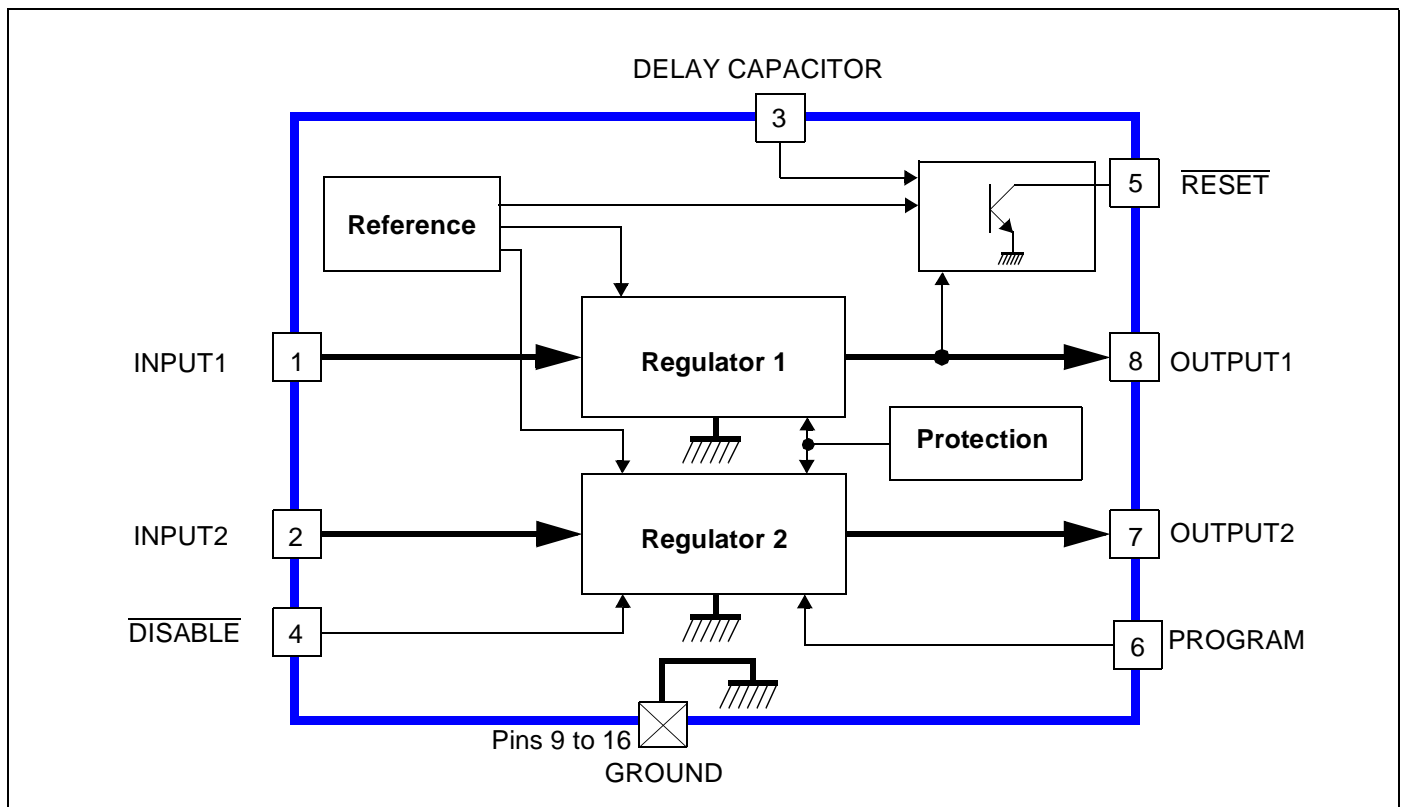


Figure 2: TDA8139D Block Diagram



2 ELECTRICAL CHARACTERISTICS

2.1 Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
V_{IN}	DC Input Voltage on pins INPUT1 and INPUT2	20	V
V_{DIS}	Disable Input Voltage	20	V
V_{RST}	Output Voltage on pin \overline{RESET}	20	V
$I_{O1,2}$	Output Currents	Internally Limited	
P_t	Power Dissipation	Internally Limited	
T_{STG}	Storage Temperature	-65 to +150	°C
T_J	Junction Temperature	0 to +150	°C

2.2 Thermal Data

Symbol	Parameter	Value	Unit	
R_{thJC}	Thermal Resistance (Junction-to-Case)	TDA8139	9	°C/W
		TDA8139D	15	
R_{thJA}	Thermal Resistance ¹ (Junction-to-Ambient)	TDA8139	50	°C/W
		TDA8139D	56	
T_J	Maximum Recommended Junction Temperature	140	°C	
T_{OPER}	Operating Free Air Temperature Range	0 to +70	°C	

1. Mounted on board. For more information, refer to [Section 5](#).

2.3 Electrical Characteristics

$T_{AMB} = 25^\circ \text{C}$, $V_{IN1} = 7 \text{V}$, $V_{IN2} = 10 \text{V}$, unless otherwise specified.

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{O1}	Output Voltage	$I_{O1} = 10 \text{mA}$	5	5.1	5.2	V
V_{O2}	Output Voltage	$I_{O2} = 10 \text{mA}$	2.8		16.0	V
$V_{IO1,2}$	Dropout Voltage	$I_{O1,2} = 750 \text{mA}$			1.4	V
$V_{O1,2LI}$	Line Regulation	$7 \text{V} < V_{IN1} < 14 \text{V}$			50	mV
		$12 \text{V} < V_{IN2} < 18 \text{V}$ $I_{O1,2} = 200 \text{mA}$, $V_{O2} = 10 \text{V}$			100	
$V_{O1,2LO}$	Load Regulation	$5 \text{mA} < I_{O1} < 600 \text{mA}$			100	mV
		$5 \text{mA} < I_{O2} < 600 \text{mA}$ $V_{O2} = 10 \text{V}$			200	

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_Q	Quiescent Current	$I_{O1} = 10 \text{ mA}$, OUTPUT2 Disabled			2	mA
V_{O1RST}	Reset Threshold Voltage	$K = V_{O1}$, $V_{IN1} \geq 7 \text{ V}$	$K - 0.4$	$K - 0.25$	$K - 0.1$	V
V_{RTH}	Reset Threshold Hysteresis	See circuit description.	20	50	75	mV
t_{RD}	Reset Pulse Delay	$C_e = 100 \text{ nF}$ See circuit description.		25		ms
V_{RL}	Saturation Voltage in Reset Condition	$I_{RESET} = 5 \text{ mA}$			0.4	V
I_{RH}	Leakage Current in Normal Condition	$I_{RESET} = 10 \text{ V}$			10	μA
$K_{O1,2}$	Output Voltage Thermal Drift	$K_0 = \frac{\Delta V_0 \cdot 10^6}{\Delta T \cdot V_0}$ $T_J = 0 \text{ to } +125^\circ\text{C}$		100		ppm/ $^\circ\text{C}$
$I_{O1,2SC}$	Short Circuit Output Current	$V_{IN1,2} = 7 \text{ V}$ $V_{IN1,2} = 16 \text{ V}^1$			1.6 1.0	A
V_{DISH}	Disable Voltage High (OUT2 active)		2			V
V_{DISL}	Disable Voltage Low (OUT2 disabled)				0.8	V
I_{DIS}	Disable Bias Current	$0 \text{ V} < V_{DIS} < 7 \text{ V}$	-100		2	μA
V_{REF}	Reference Voltage at PROGRAM Pin			2.5		V
T_{JSD}	Junction Temperature for Thermal Shutdown			145		$^\circ\text{C}$

1. The output short-circuit currents are tested one channel at time. During a short-circuit, a large consumption of power occurs, but the thermal protection circuit prevents any excessive temperatures. A safe permanent short-circuit protection is only guaranteed for input voltages up to 16 V.

3 CIRCUIT DESCRIPTION

The TDA8139 and the TDA8139D are dual-voltage regulators with Reset and Disable functions.

The two regulation parts are supplied from a single voltage reference circuit trimmed by zener zapping during EWS testing. Since the supply voltage of this voltage reference is connected to pin INPUT1 (V_{IN1}), the second regulator will not work if pin INPUT1 is not supplied.

The adjustable voltage of pin OUTPUT2 (V_{O2}) is defined by output bridge resistors (R1, R2): the values of these resistors are calculated to obtain, with the targetted value for V_{O2} , the reference voltage ($V_{REF} = 2.5$ V) on the median point connected to pin PROGRAM.

The output stages have been realized using a Darlington configuration with a typical dropout voltage of 1.2 V.

The Disable circuit will switch off pin OUTPUT2 if a voltage less than 0.8 V is applied to pin DISABLE.

The Reset circuit checks the voltage at pin OUTPUT1. If this voltage drops below $V_{O1} - 0.25$ V (4.85 V Typ.), the "a" comparator (Figure 3) rapidly discharges capacitor C_e and the reset output immediately switches to low. When the voltage at pin OUTPUT1 exceeds $V_{O1} - 0.2$ V (4.9 V Typ.), the external capacitor voltage (V_{C_e}) increases linearly to the reference voltage ($V_{REF} = 2.5$ V) corresponding to a Reset Pulse Delay t_{RD} as shown in Figure 4.

$$t_{RD} = \frac{C_e \times 2.5V}{10\mu A}$$

Afterwards, the reset output returns to high. To avoid glitches in the reset output, the second comparator "b" has a large hysteresis (1.9 V).

Figure 3: Reset Diagram

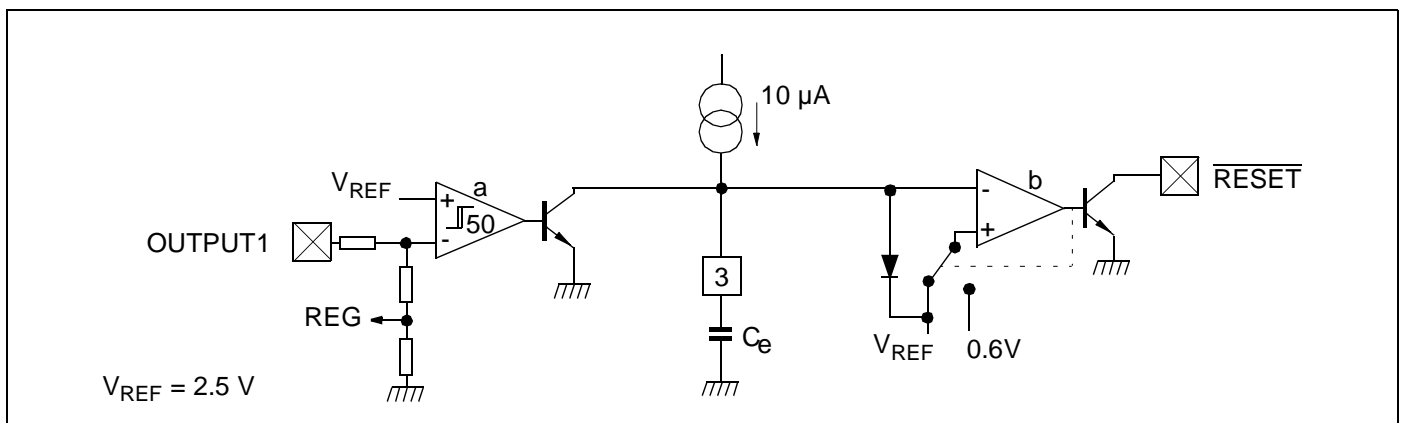
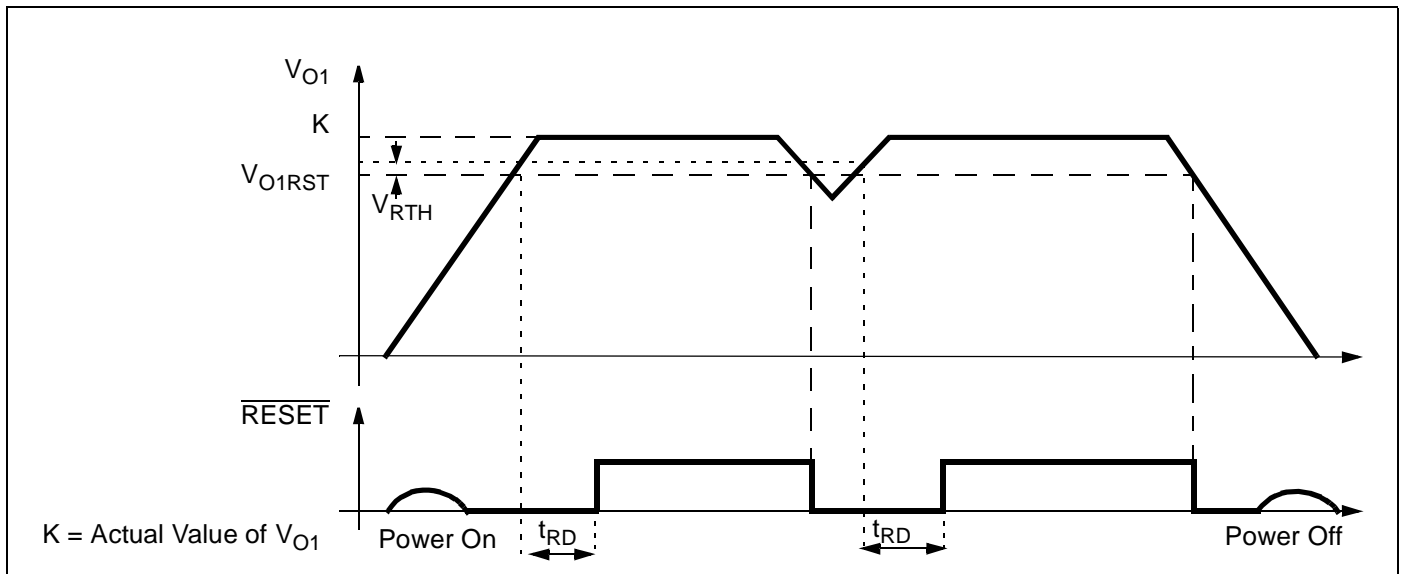


Figure 4: Internal Reset Voltages



4 APPLICATION DIAGRAM

Figure 5: TDA8139 Typical Application

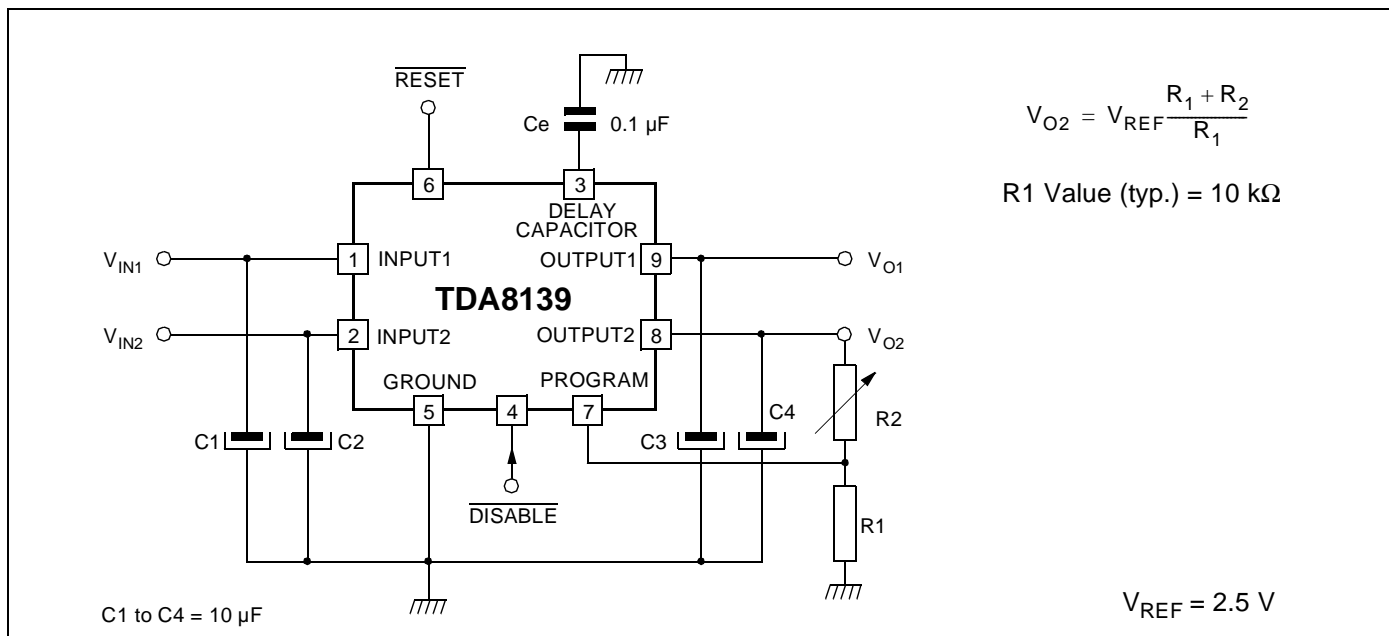
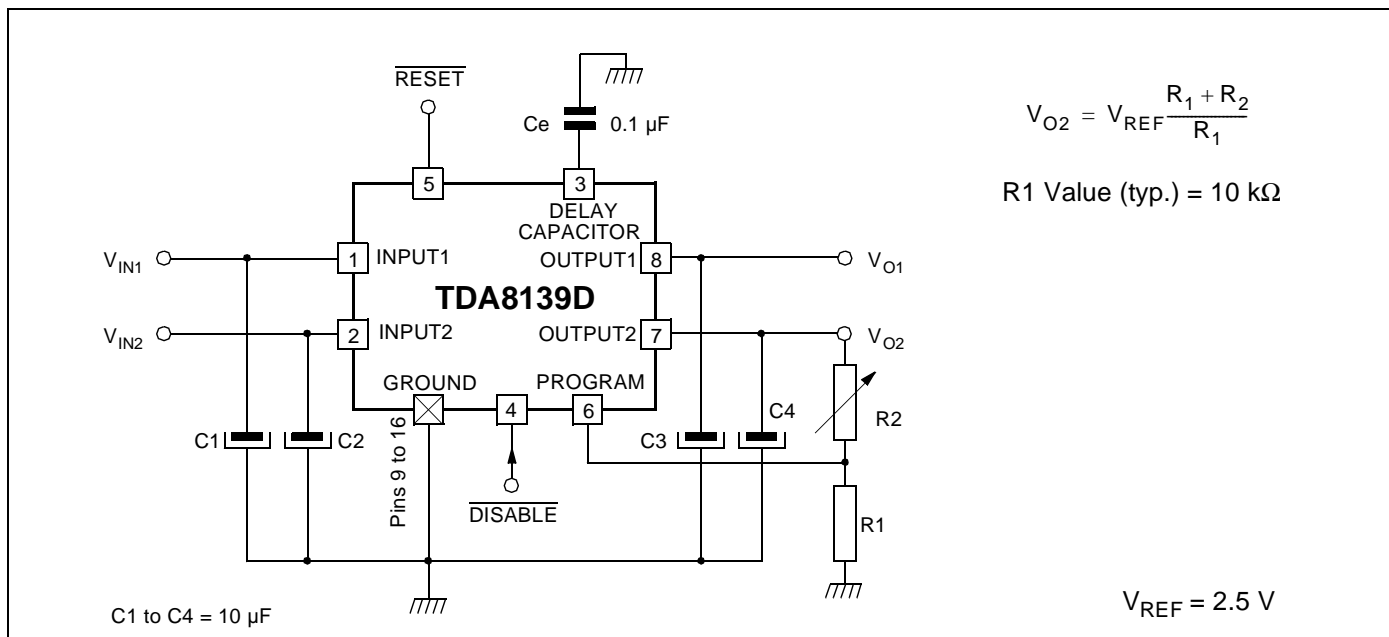


Figure 6: TDA8139D Typical Application



5 POWER DISSIPATION AND LAYOUT INDICATIONS

The power is mainly dissipated by the two device buffers. It can be calculated by the equation:

$$P = (V_{IN1} - V_{O1}) \times I_{OUT1} + (V_{IN2} - V_{O2}) \times I_{O2}$$

The following table lists the different R_{thJA} values of these packages with or without a heat sink and the corresponding maximum power dissipation assuming:

- Maximum Ambient Temperature = 70° C
- Maximum Junction Temperature = 140° C

Device	Heat Sink	R_{thJA} in °C/W	P_{MAX} in W
TDA8139	No	50	1.4
	Yes	20	3.5
TDA8139D	No	56 to 40	1.25 to 1.75
	Yes	32	2.2

Figure 7: Thermal Resistance (Junction-to-Ambient) of DIP16 Package without Heat Sink

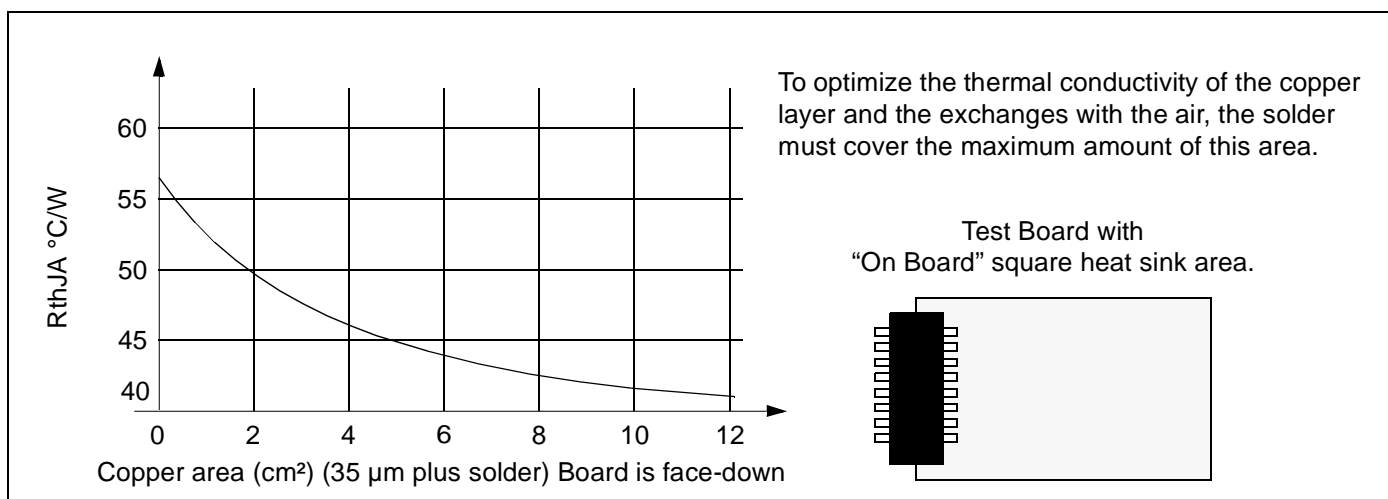
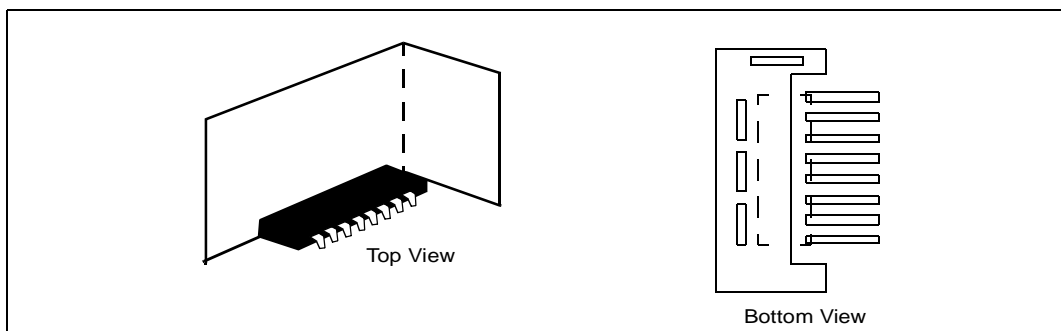
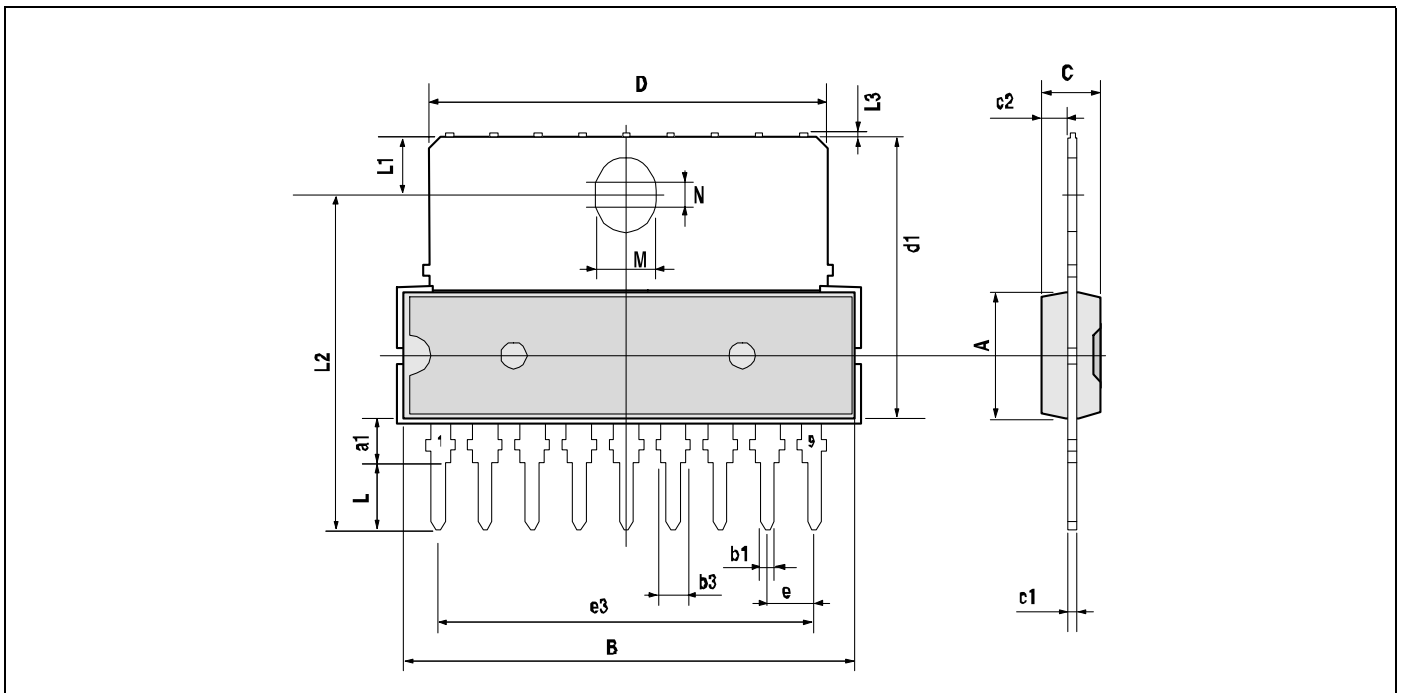


Figure 8: Metal plate mounted near the TDA8139D for heat sinking



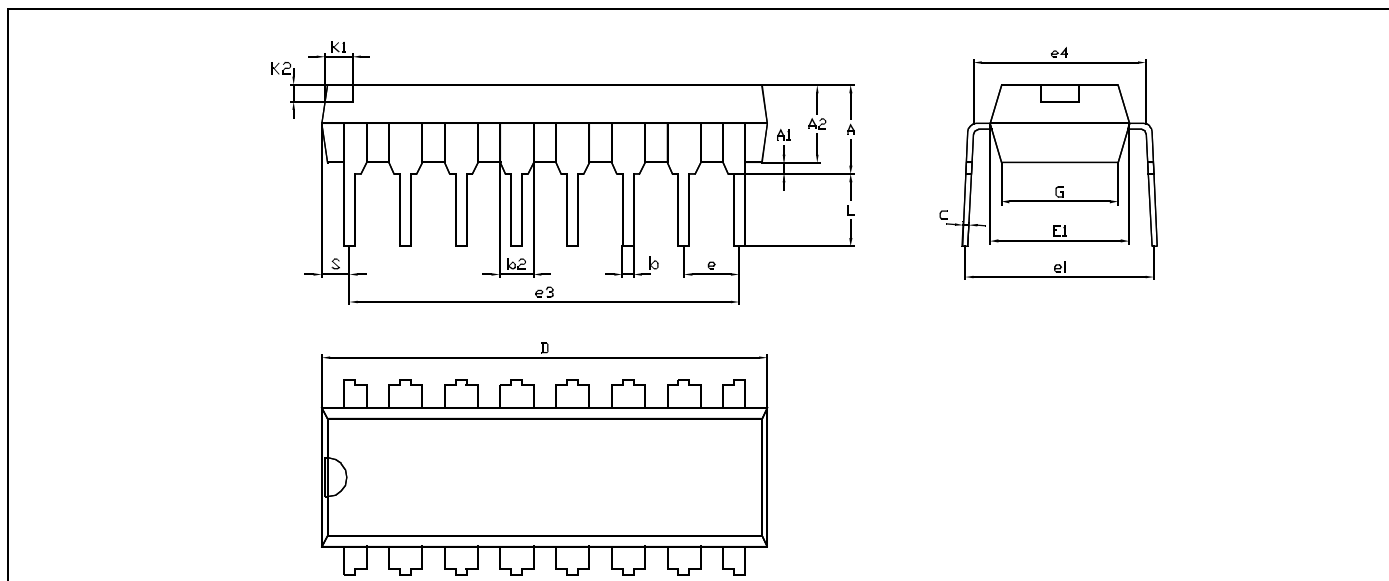
6 PACKAGE MECHANICAL DATA

Figure 9: 9-Pin Plastic Single In Line Package



Dim.	mm			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			7.1			0.280
a1	2.7		3	0.106		0.118
B			24.8			0.976
b1		0.5			0.020	
b3	0.85		1.6	0.033		0.063
C		3.3			0.130	
c1		0.43			0.017	
c2		1.32			0.052	
D			21.2			0.835
d1		14.5			0.571	
e		2.54			0.100	
e3		20.32			0.800	
L	3.1			1.122		
L1		3			0.116	
L2		17.6			0.693	
L3			0.25			0.010
M		3.2			0.126	
N		1			0.039	

Figure 10: 16-Pin Plastic Dual In-Line Package, 300-mil Width



Dim.	mm			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			5.33			0.210
A1	0.38			0.015		
A2	2.92	3.30	4.95	0.115	0.130	0.195
b	0.36		0.56	0.014		0.022
b2		1.52	1.78		0.060	0.070
c	0.20	0.25	0.36	0.008	0.010	0.014
D	18.67	19.18	19.69	0.735	0.755	0.775
e		2.54			0.100	
E1	6.10	6.35	7.11	0.240	0.250	0.280
L	2.92	3.30	3.81	0.115	0.130	0.150

7 REVISION HISTORY

Revision	Main Changes	Date
1.0	First Issue	March 1994
1.3		October 2000
1.4	Datasheet Update and addition of DIP16 package	July 2001
1.5	General Update; DISABLE pin renamed $\overline{\text{DISABLE}}$ (function remains unchanged).	August 2001
1.6	Thermal Data updated.	September 2001
1.7	Thermal Data updated. Figure 1 and Figure 2 updated.	October 2001

NOTES:

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