

2A DDR Termination Regulator

FEATURES

- V_{CNTL} Input Voltage Range: 2.375V to 5.5V
- V_{IN} Input Voltage Range: 1.1V to 5.5V
- Continuous 2A Source and Sink Current
- Support DDR / DDRII / DDRIII / Low Power DDRIII / DDRIV Requirements
- Low Output Voltage Offset, $\pm 20\text{mV}$
- High Accuracy Output Voltage at Full-Load
- Adjustable V_{OUT} by External Resistor
- Stable with 22 μF Ceramic Output Capacitor
- Low External Component Count
- Built in Soft Start, UVLO and OCP Protection
- Thermal Shutdown Protection
- SOP-8 Exposed Pad Packages
- RoHS Compliant and Green Package

APPLICATIONS

- Desktop PCs, Notebooks and Workstations
- Graphic Cards
- Set Top Boxes, Digital TVs, Printers
- DDR/II/III Termination Voltage Supply

DESCRIPTION

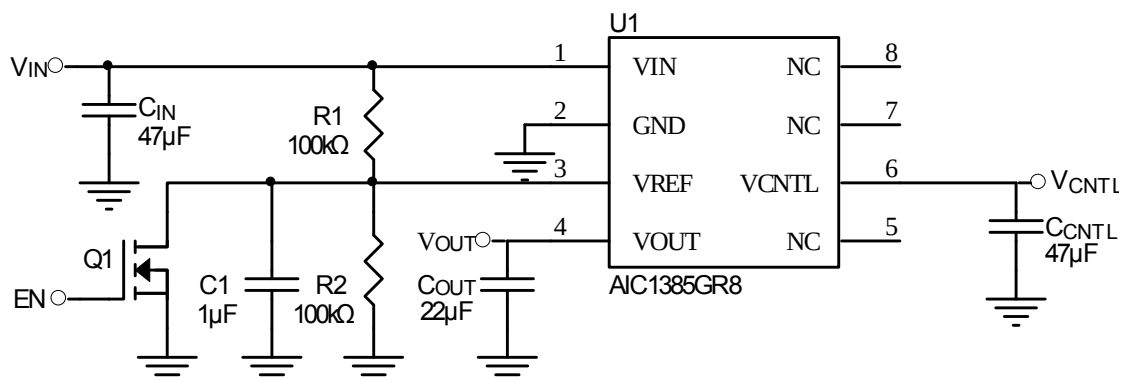
AIC1385 linear regulator is designed to achieve 2A source and sink current for termination of. DDR / DDRII / DDRIII while regulating an output voltage to within $\pm 20\text{mV}$. And it can deliver 1.5A continue current for termination of DDRIV.

AIC1385 converts voltage supplies range from 1.1V to 5.5V into an output voltage that adjusts by two external voltage divider resistors. It provides an excellent voltage source for active termination schemes of high-speed transmission lines as those seen in double data rate (DDR) memory system, and it meets the JEDEC SSTL-2 and SSTL-18 or other specific interfaces such as HSTL, SCSI-1 and SCSI-3 specifications for termination of DDR-SRAM.

Built-in current limiting in source and sink mode, on-chip thermal shutdown protection to against fault conditions.

The AIC1385 is available in the SOP-8 with exposed pad package

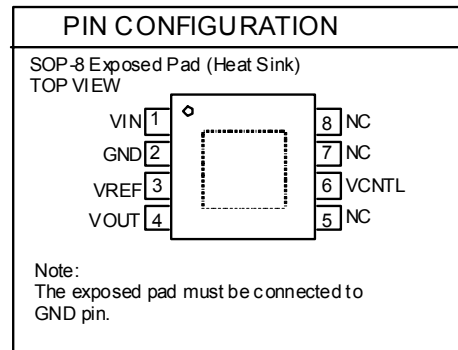
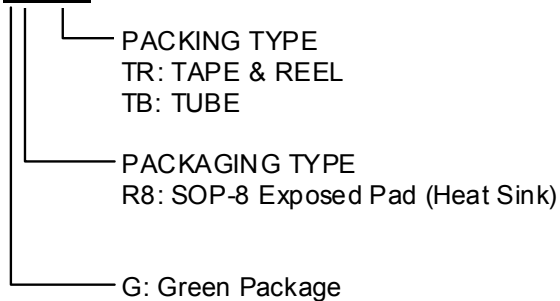
TYPICAL APPLICATION CIRCUIT



Typical Application Circuit

ORDERING INFORMATION

AIC1385XXXXX



Example: AIC1385GR8TR

→ In Green SOP-8 Exposed Pad (Heat Sink) Package & Taping & Reel Packing

ABSOLUTE MAXIMUM RATINGS

V_{IN} , V_{REF} , V_{CNTL} , to GND		-0.3V to 6V
Operating Temperature Range		-40°C ~ 85°C
Junction Temperature		150°C
Storage Temperature Range		- 65°C ~ 150°C
Lead Temperature (Soldering. 10 sec)		260°C
Thermal Resistance Junction to Ambient, θ_{JA}	SOP-8 Exposed Pad (Heat Sink)*.....	60°C /W
Thermal Resistance Junction to Case, θ_{JC}	SOP-8 Exposed Pad (Heat Sink)*.....	16°C /W
(Assume no Ambient Airflow)		

Absolute Maximum Ratings are those values beyond which the life of a device may be impaired.

*The package is place on a two layers PCB with 2 ounces copper and 2 square inch, connected by 8 vias.

ELECTRICAL CHARACTERISTICS

($V_{\text{CNTL}}=3.3\text{V}$, $V_{\text{IN}}=1.8\text{V}/1.5\text{V}$, $V_{\text{REF}}=0.5V_{\text{IN}}$, $C_{\text{OUT}}=22\mu\text{F}$, $T_{\text{A}}=25^{\circ}\text{C}$, unless otherwise specified)
(Note 1)

PARAMETER	TEST CONDITIONS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Input Voltage	Keep operate $V_{\text{CNTL}} \geq V_{\text{IN}}$ at power on and off sequences	V_{IN}	1.1	1.8	5.5	V
		V_{CNTL}	2.375	3.3	5.5	
Output Voltage	$I_{\text{OUT}} = 0\text{mA}$	V_{OUT}	V_{REF}			V
Output Voltage Offset	$I_{\text{OUT}} = 0\text{mA}$	V_{OS}	-20		20	mV
Load Regulation	$I_{\text{OUT}} = 0.1\text{mA} \sim +2\text{A}$	ΔV_{LOR}	-20		20	mV
	$I_{\text{OUT}} = 0.1\text{mA} \sim -2\text{A}$		-20		20	
Quiescent Current	$V_{\text{REF}} < 0.2\text{V}$, $V_{\text{OUT}} = \text{OFF}$	I_{Q}		2	90	μA
Operating Current of V_{CNTL}	No load	I_{CNTL}		1	2.5	mA
Supply Current of V_{IN}	$V_{\text{CNTL}}=5\text{V}$, No load			1	3	mA
V_{REF} Bias Current	$V_{\text{REF}}=1.25\text{V}$		0		1	μA
Current Limit	Source: $V_{\text{OUT}} = 0.33 \times V_{\text{REF}}$	I_{IL}	2.4	3.0		A
	Sink: $V_{\text{OUT}} = 0.95 \times V_{\text{IN}}$					
Output Discharge Resistance	$V_{\text{REF}}=0\text{V}$, $V_{\text{OUT}}=0.3\text{V}$	R_{DSCHG}		18	25	Ω
THERMAL PROTECTION						
Thermal Shutdown Temperature	$3.3\text{V} \leq V_{\text{CNTL}} \leq 5\text{V}$	T_{SD}		160		$^{\circ}\text{C}$
Thermal Shutdown Hysteresis	Guaranteed by design			30		$^{\circ}\text{C}$
SHUTDOWN SPECIFICATIONS						
Shutdown Threshold	Output ON ($V_{\text{REF}}=0\text{V} \rightarrow 1.25\text{V}$)		0.6			V
	Output OFF ($V_{\text{REF}}=1.25\text{V} \rightarrow 0\text{V}$)				0.2	

Note 1: Specifications are production tested at $T_{\text{A}}=25^{\circ}\text{C}$. Specifications over the -40°C to 85°C operating temperature range are assured by design, characterization and correlation with Statistical Quality Controls (SQC).

Note 2: V_{OS} is the voltage measurement, which is defined as V_{OUT} subtracted V_{REF} .

Note 3: Load regulation is measured at constant junction temperature, using pulse testing with a low ON time.

Note 4: Current limit is measured by pulse load.

Note 5: For operate system safely; V_{CNTL} must be always greater than V_{IN} .

TYPICAL PERFORMANCE CHARACTERISTICS

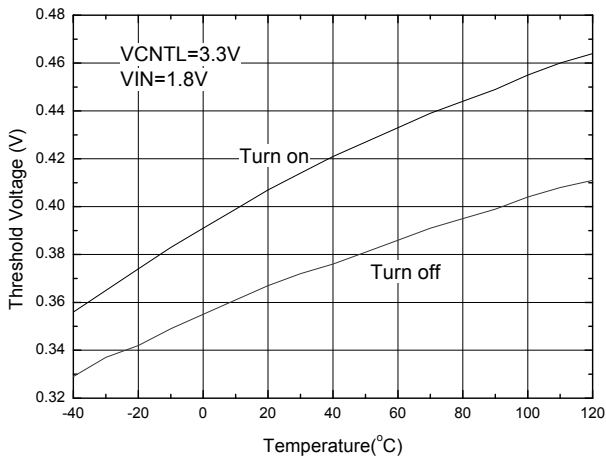


Fig.1 Turn on and turn off vs. Temperature

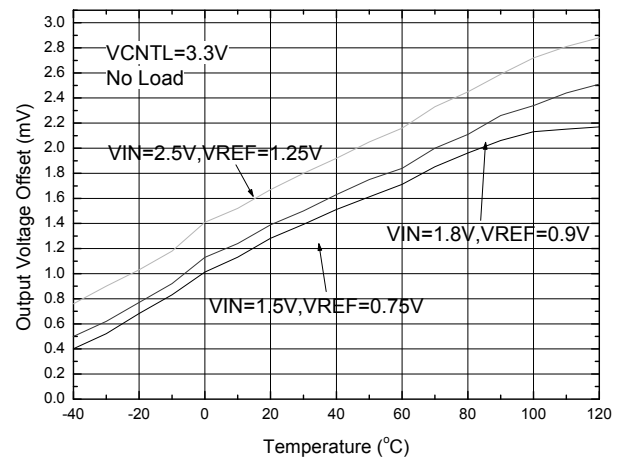


Fig.2 Output Voltage vs. Temperature

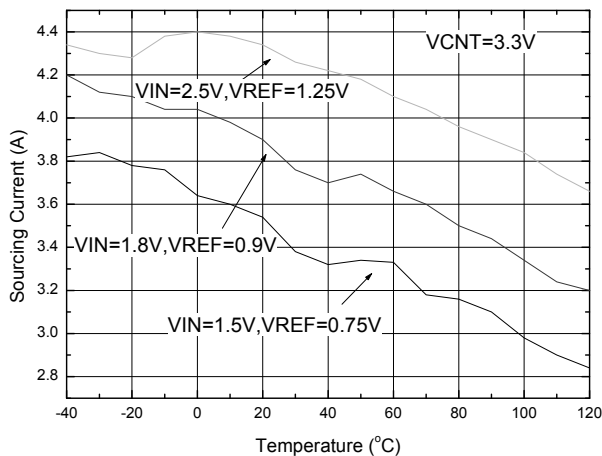


Fig.3 Current limit (Sourcing) vs. Temperature

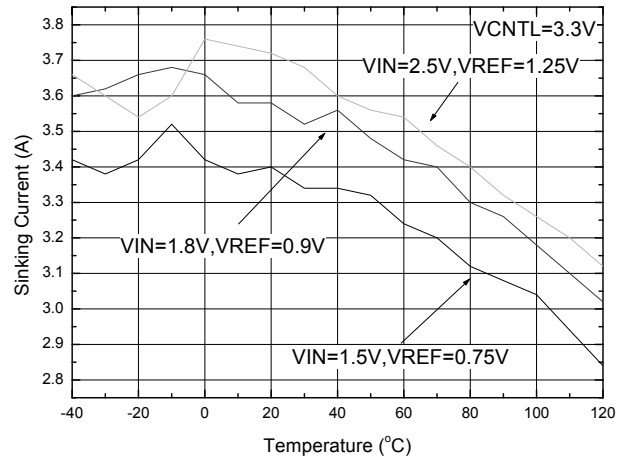
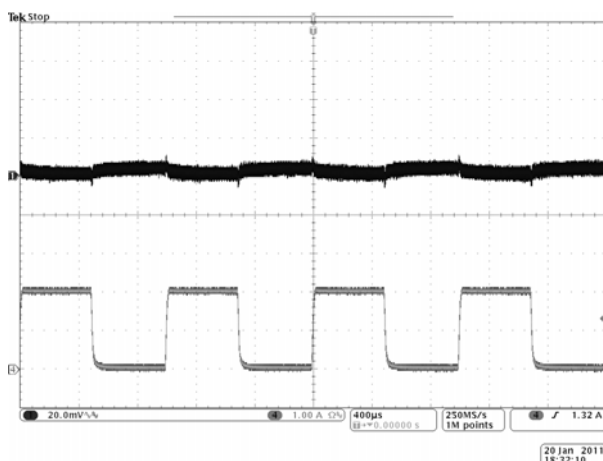
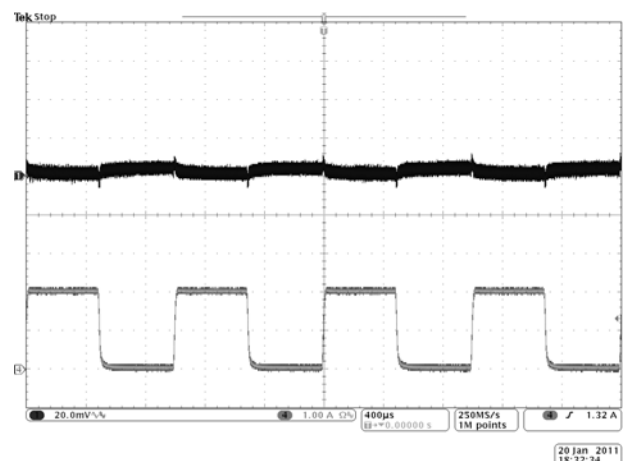


Fig.4 Current limit (Sinking) vs. Temperature


Fig.5 $V_{IN}=1.5V$, $V_{REF}=0.75V$ Source Response

Fig.6 $V_{IN}=1.8V$, $V_{REF}=0.9V$ Source Response

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

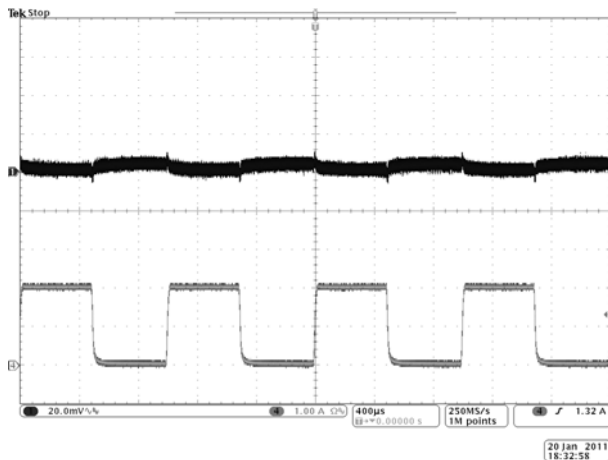


Fig.7 $V_{IN}=2.5V$, $V_{REF}=1.25V$ Source Response

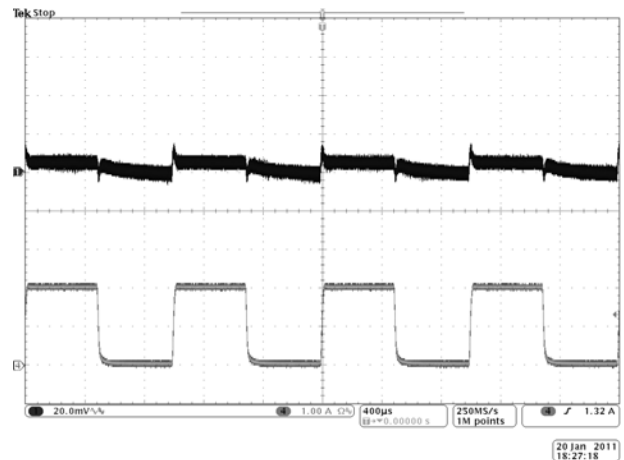


Fig.8 $V_{IN}=1.5V$, $V_{REF}=0.75V$ Sink Response

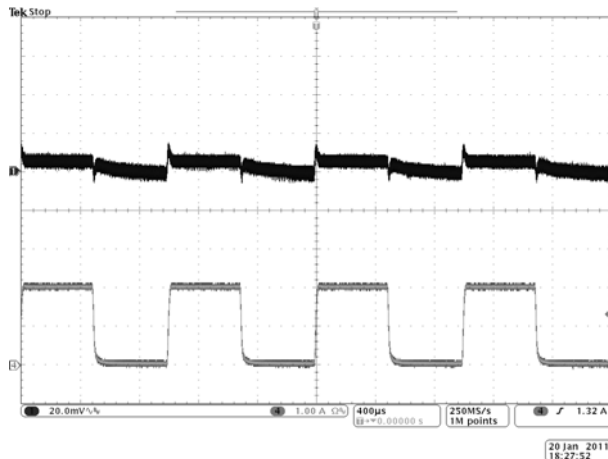


Fig.9 $V_{IN}=1.8V$, $V_{REF}=0.9V$ Sink Response

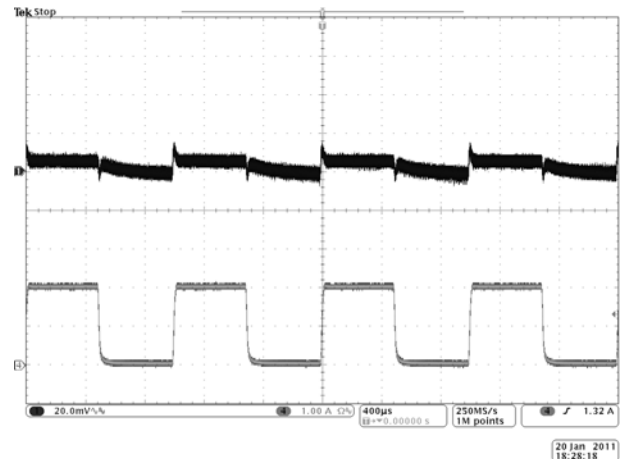


Fig.10 $V_{IN}=2.5V$, $V_{REF}=1.25V$ Sink Response

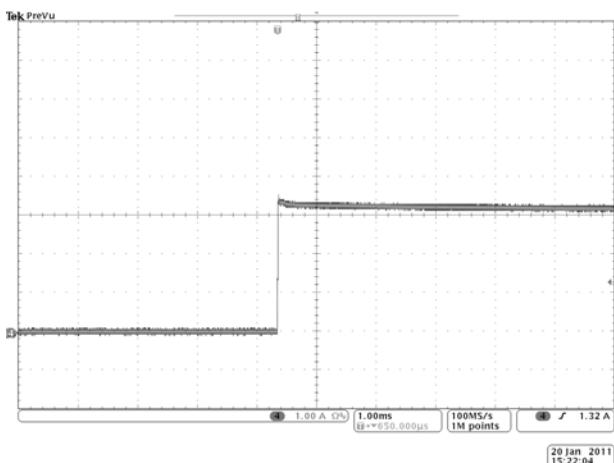


Fig.11 $V_{IN}=1.5V$, $V_{REF}=0.75V$ Source Short Circuit

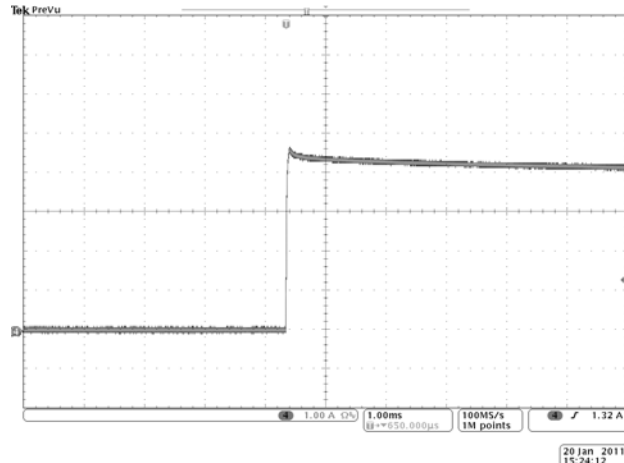
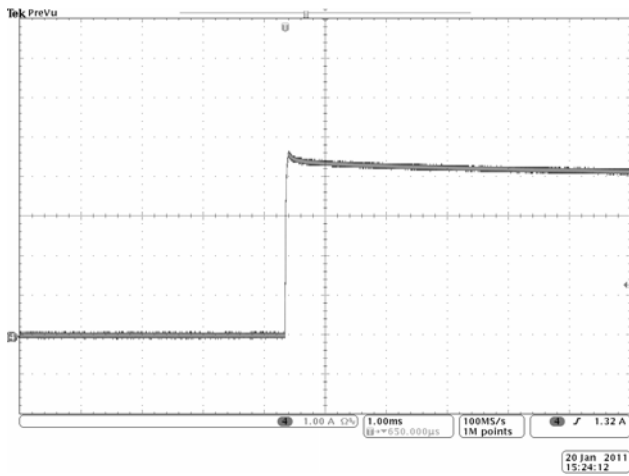
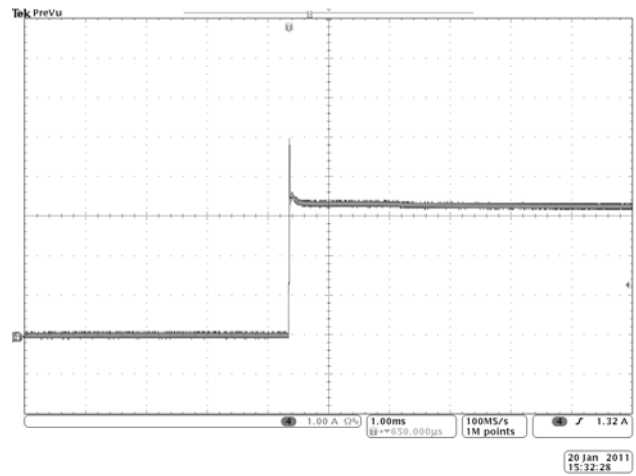
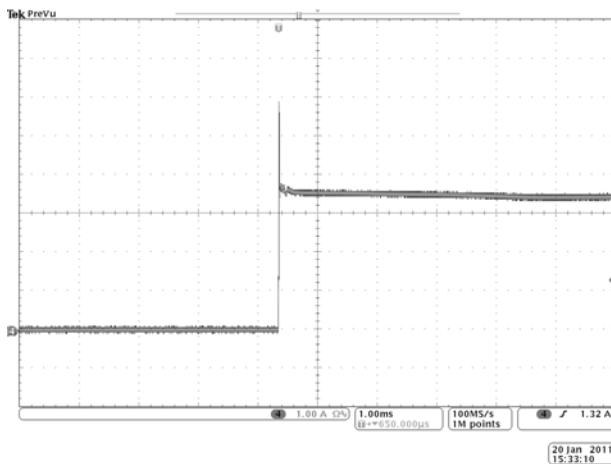
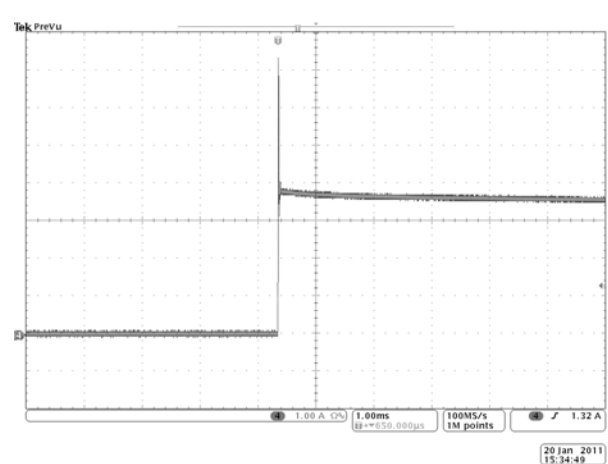
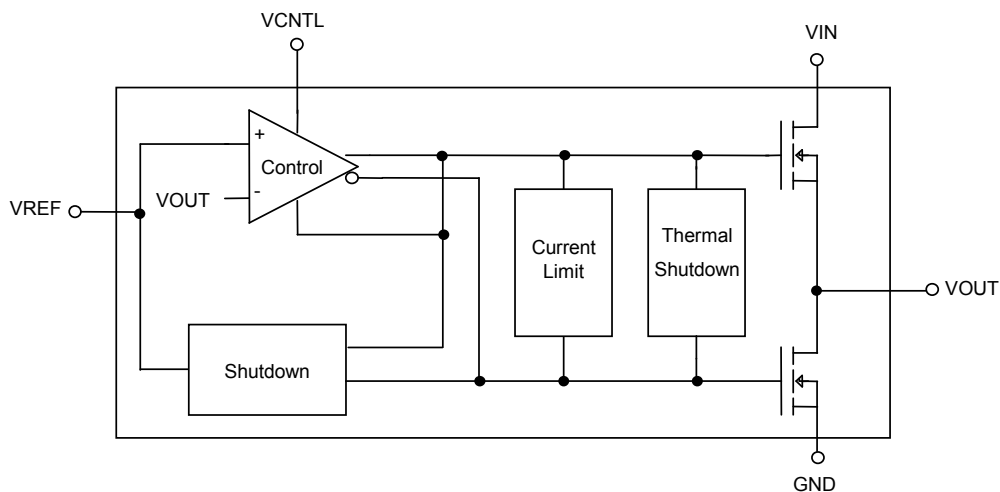


Fig.12 $V_{IN}=1.8V$, $V_{REF}=0.9V$ Source Short Circuit

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)


Fig.13 $V_{IN} = 2.5V$, $V_{REF} = 1.25V$ Source Short Circuit

Fig.14 $V_{IN} = 1.5V$, $V_{REF} = 0.75V$ Sink Short Circuit

Fig.15 $V_{IN} = 1.8V$, $V_{REF} = 0.9V$ Sink Short Circuit

Fig.16 $V_{IN} = 2.5V$, $V_{REF} = 1.25V$ Sink Short Circuit

BLOCK DIAGRAM



■ PIN DESCRIPTIONS

PIN 1: V_{IN} - Input supply pin. It provides main power to create the external reference voltage by divider resistors for regulating V_{REF} and V_{OUT} .

PIN 2: GND - Ground pin.

PIN 3: V_{REF} - Reference voltage input. Pull this pin low to shutdown device.

PIN 4: V_{OUT} -Output pin.

PIN 5: NC

PIN 6: V_{CNTL} - Input supply pin. It is used to supply all the internal control circuitry.

PIN 7: NC

PIN 8: NC

■ APPLICATION INFORMATION

AIC1385 is a Continuous 2A source and sink current DDR termination regulator. It is specifically designed for low-cost and low-external component count system such as notebook PC applications. The AIC1385 possesses a high speed-operating amplifier that provides fast load transient response and only requires a 47 μ F ceramic input capacitor and 22 μ F ceramic output capacitor.

Layout Consideration

AIC1385 is in SOP-8 with exposed pad package resulting in able to dissipate heat easily when it operates in high current. In order to prevent maximum junction temperature exceeded, the suitable copper area has to use. The large copper at GND pins is available, and the heat dissipation is relieved. Using via to lead heat into the bottom layer. All capacitors should be placed as close as possible to relative pins.

Low VCTL Applications

AIC1385 can be used in an application system where either a 2.5V, 3.3V or 5.0V rail is available. The VCTL minimum input voltage requirement is 2.375V. If a 2.5V rail is used, the maximum continuous Source and Sink Current is 1.5A.

Thermal Considerations

For continuous operation, do not exceed absolute maximum operation junction temperature. The maximum power dissipation depends on the thermal resistance of IC package, PCB layout, the rate of surroundings airflow and temperature difference between junctions to ambient.

The maximum power dissipation can be calculated by following formula:

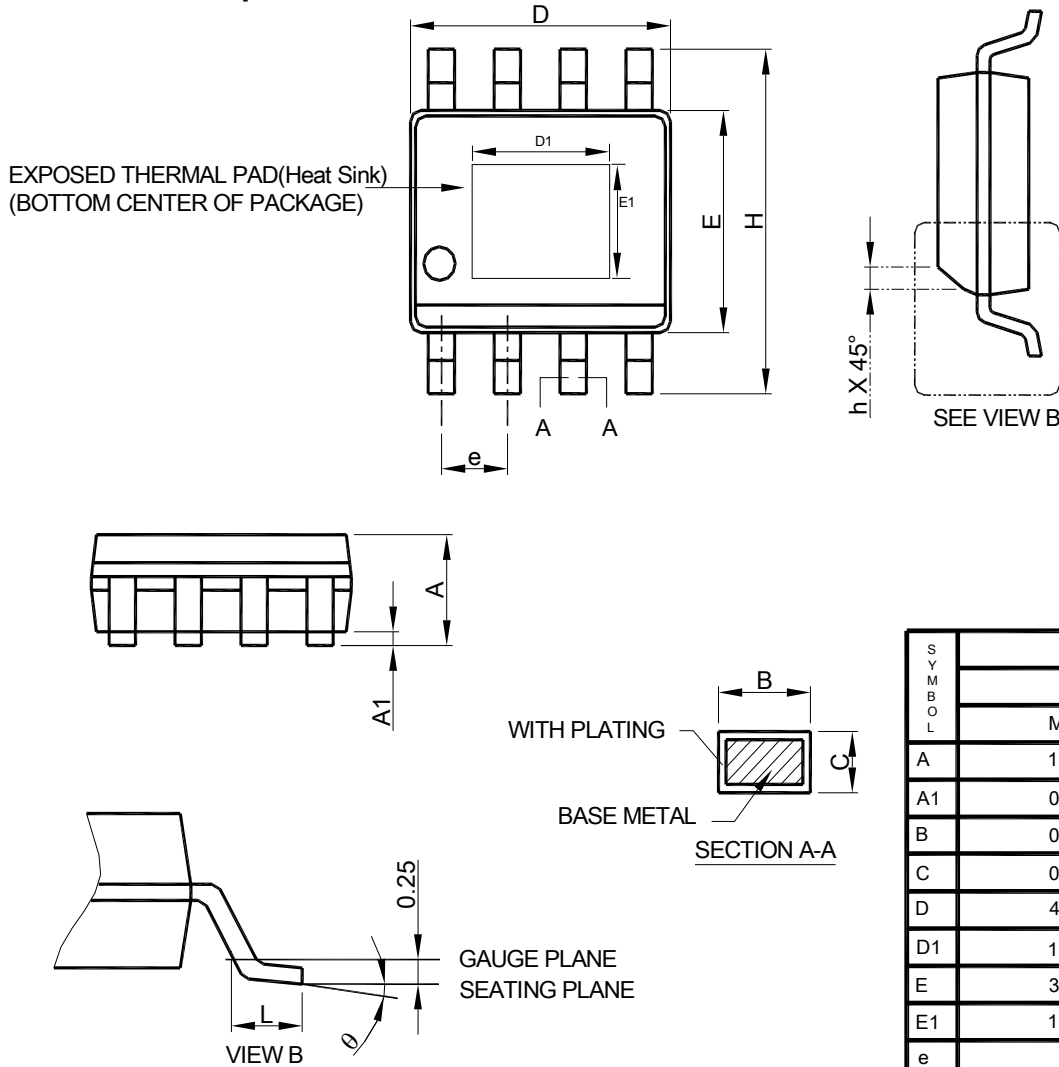
$$P_{D(max)} = [T_{J(max)} - T_A] / \theta_{JA}$$

Where $T_{J(max)}$ is the maximum operation junction temperature, T_A is the ambient temperature and the θ_{JA} is the junction to ambient thermal resistance. For recommended operating conditions specification of the AIC1385, the maximum junction temperature is 150°C. The thermal resistance θ_{JA} for SOP-8 with exposed pad package is 60°C/W. The maximum power dissipation at $T_A = 25^\circ\text{C}$ can be calculated by following formula:

$$P_{D(max)} = [150^\circ\text{C} - 25^\circ\text{C}] / 60^\circ\text{C/W} = 2.08\text{W for SOP-8 with exposed pad package.}$$

■ PHYSICAL DIMENSIONS (unit: mm)

● SOP-8 Exposed Pad



Note : 1. Refer to JEDEC MS-012E.

2. Dimension "D" does not include mold flash, protrusions or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 6 mil per side .
3. Dimension "E" does not include inter-lead flash or protrusions.
4. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

Note:

Information provided by AIC is believed to be accurate and reliable. However, we cannot assume responsibility for use of any circuitry other than circuitry entirely embodied in an AIC product; nor for any infringement of patents or other rights of third parties that may result from its use. We reserve the right to change the circuitry and specifications without notice.

Life Support Policy: AIC does not authorize any AIC product for use in life support devices and/or systems. Life support devices or systems are devices or systems which, (i) are intended for surgical implant into the body or (ii) support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.

SYMBOL	SOP-8 Exposed Pad(Heat Sink)	
	MILLIMETERS	
	MIN.	MAX.
A	1.35	1.75
A1	0.00	0.15
B	0.31	0.51
C	0.17	0.25
D	4.80	5.00
D1	1.50	3.50
E	3.80	4.00
E1	1.0	2.55
e	1.27 BSC	
H	5.80	6.20
h	0.25	0.50
L	0.40	1.27
θ	0°	8°