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, ±20mV
- High Accuracy Output Voltage at Full-Load
- Adjustable V_{OUT} by External Resistor
- Stable with 22μF 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

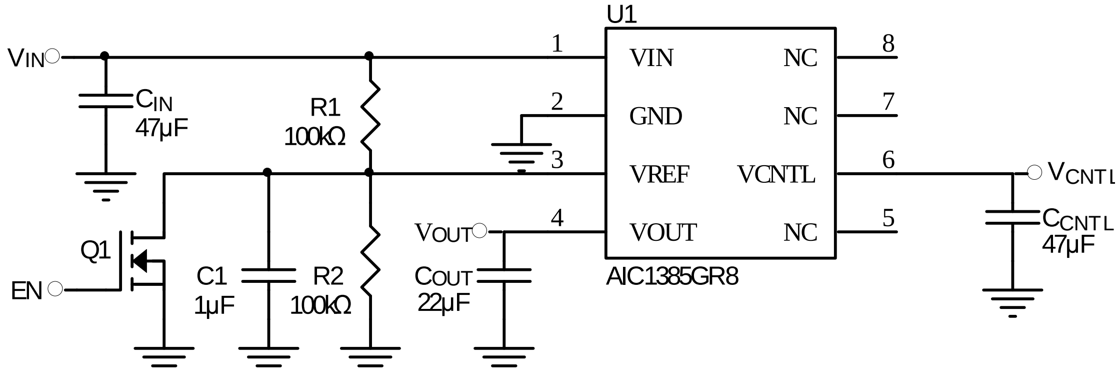
AIC1385 linear regulator is designed to achieve 2A source and sink current for termination of. DDR / DDRII / DDRIII while regulating an output voltage to within ±20mV. And it can deliver 1.5A continue current for termination of DDRIV.

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

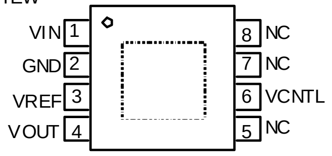
AIC1385XXXXX

- PACKING TYPE
  TR: TAPE & REEL
  TB: TUBE
- PACKAGING TYPE
  R8: SOP-8 Exposed Pad (Heat Sink)
- G: Green Package

Example: AIC1385GR8TR
→ In Green SOP-8 Exposed Pad (Heat Sink)Package & Taping & Reel Packing

PIN CONFIGURATION

SOP-8 Exposed Pad (Heat Sink)
TOP VIEW



Note:
The exposed pad must be connected to GND pin.

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_{CNTL}=3.3V, V_{IN}=1.8V/1.5V, V_{REF}=0.5V_{IN}, C_{OUT}=22μF, T_A=25°C, unless otherwise specified) (Note 1)

PARAMETER	TEST CONDITIONS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Input Voltage	Keep operate $V_{CNTL} \geq V_{IN}$ 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_{OUT} = 0mA	V_{OUT}		V_{REF}		V
Output Voltage Offset	I_{OUT} = 0mA	V_{OS}	-20		20	mV
Load Regulation	I_{OUT} =0.1mA ~ +2A	ΔV_{LOR}	-20		20	mV
	I_{OUT} =0.1mA ~ -2A		-20		20	
Quiescent Current	V_{REF}<0.2V, V_{OUT} = 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_{CNTL}=5V, No load			1	3	mA
V_{REF} Bias Current	V_{REF}=1.25V		0		1	μA
Current Limit	Source: V_{OUT} =0.33xV_{REF} Sink: V_{OUT} =0.95x V_{IN}	I_{IL}	2.4	3.0		A
Output Discharge Resistance	V_{REF}=0V, V_{OUT}=0.3V	R_{DSCHG}		18	25	Ω
THERMAL PROTECTION						
Thermal Shutdown Temperature	3.3V≤V_{CNTL}≤5V	T_{SD}		160		°C
Thermal Shutdown Hysteresis	Guaranteed by design			30		°C
SHUTDOWN SPECIFICATIONS						
Shutdown Threshold	Output ON (V_{REF}=0V→1.25V)		0.6			V
	Output OFF (V_{REF}=1.25V→0V)				0.2	

Note 1: Specifications are production tested at T_A=25°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

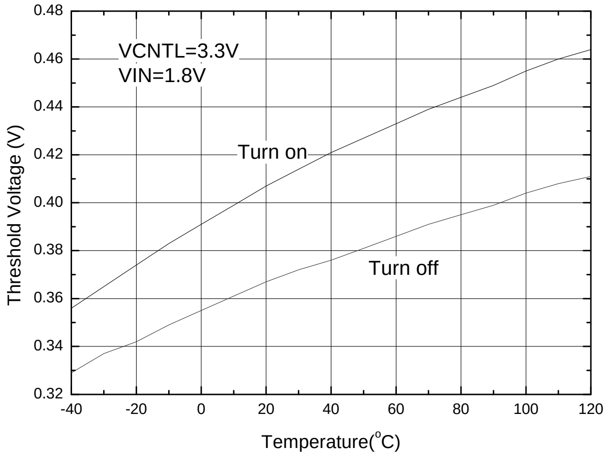


Fig.1 Turn on and turn off vs. Temperature

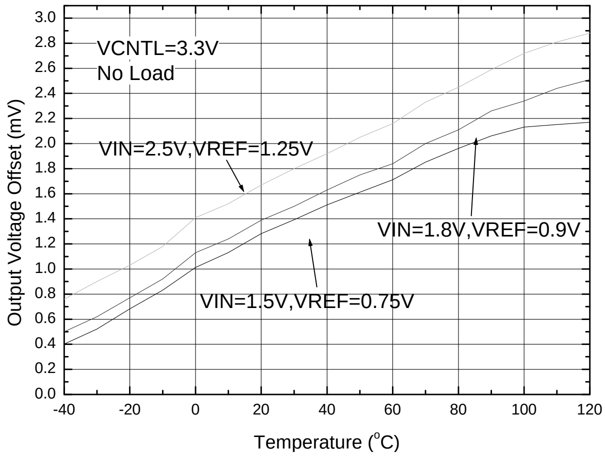


Fig.2 Output Voltage vs. Temperature

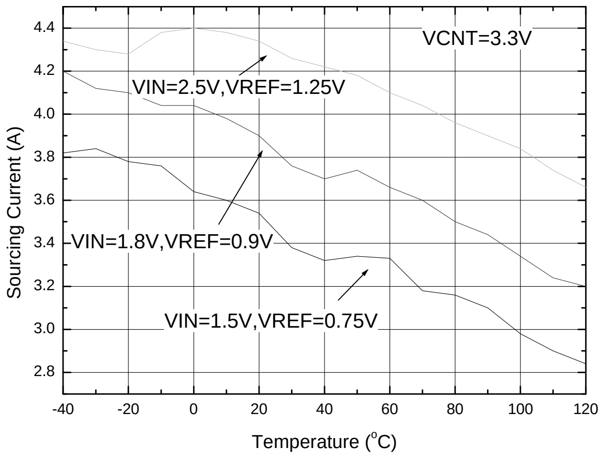


Fig.3 Current limit (Sourcing) vs. Temperature

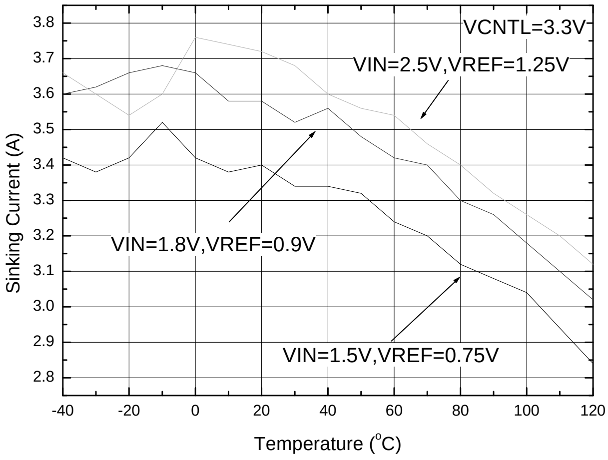


Fig.4 Current limit (Sinking) vs. Temperature

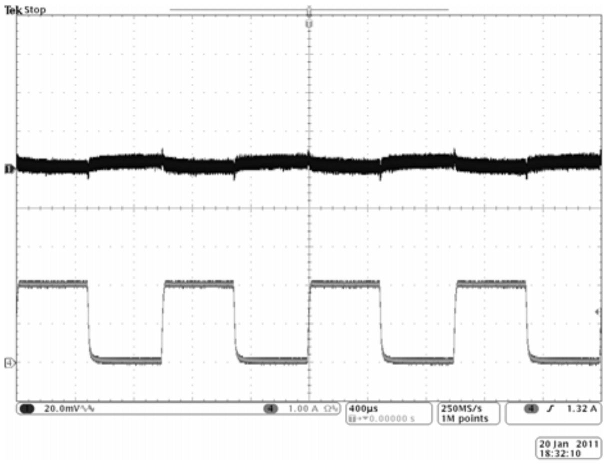


Fig.5 V_{IN} =1.5V, V_{REF}=0.75V Source Response

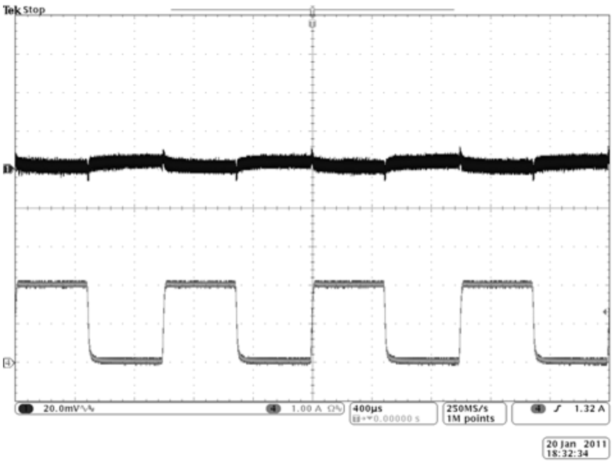


Fig.6 V_{IN} =1.8V, V_{REF}=0.9V Source Response

■ TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

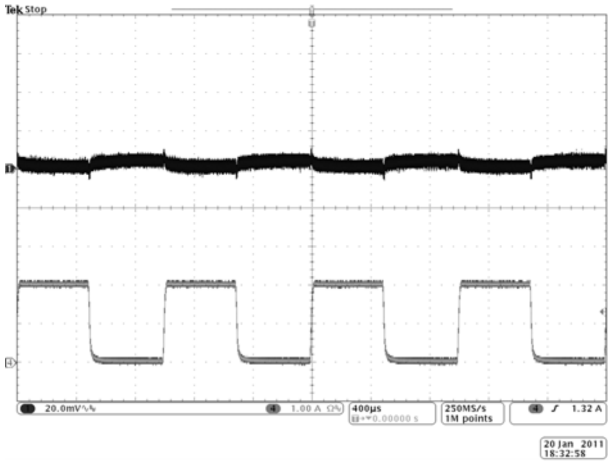


Fig.7 V_{IN} =2.5V, V_{REF}=1.25V Source Response

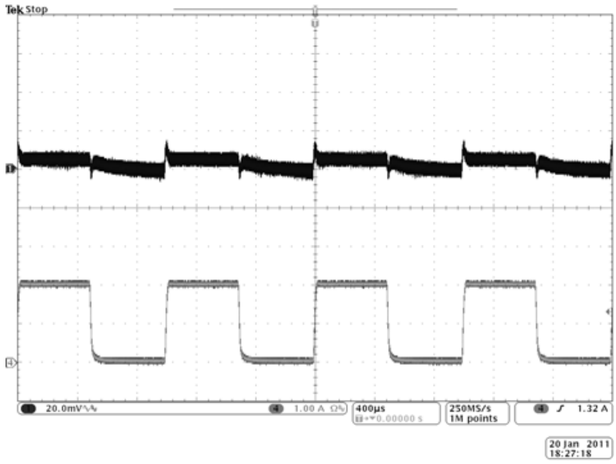


Fig.8 V_{IN} =1.5V, V_{REF}=0.75V Sink Response

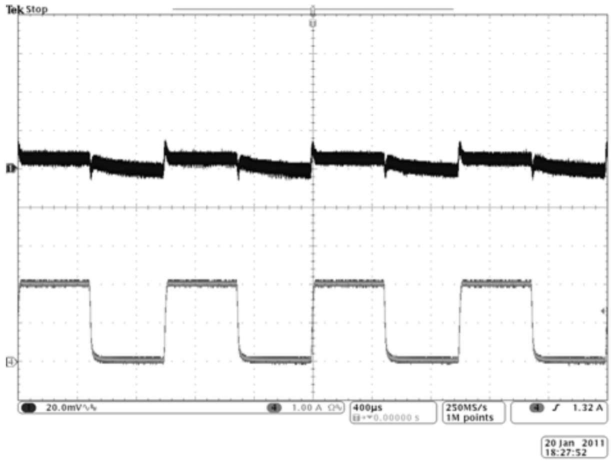


Fig.9 V_{IN} =1.8V, V_{REF}=0.9V Sink Response

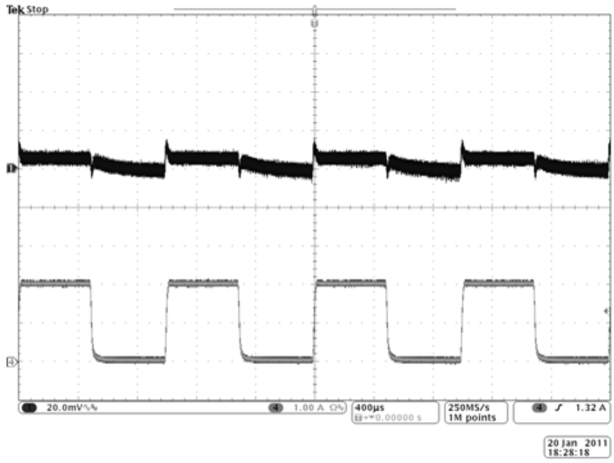


Fig.10 V_{IN} =2.5V, V_{REF}=1.25V Sink Response

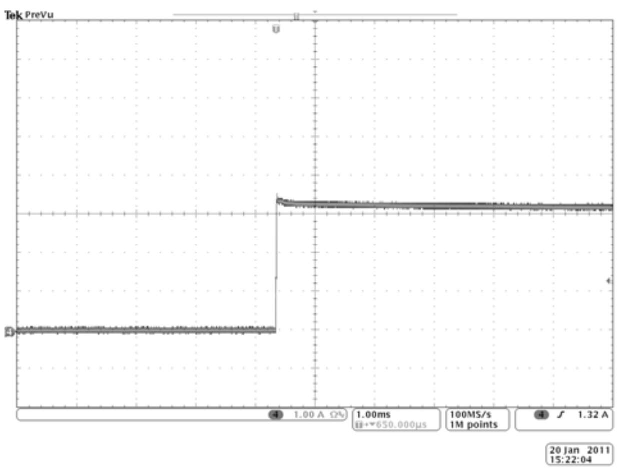


Fig.11 V_{IN} =1.5V, V_{REF}=0.75V Source Short Circuit

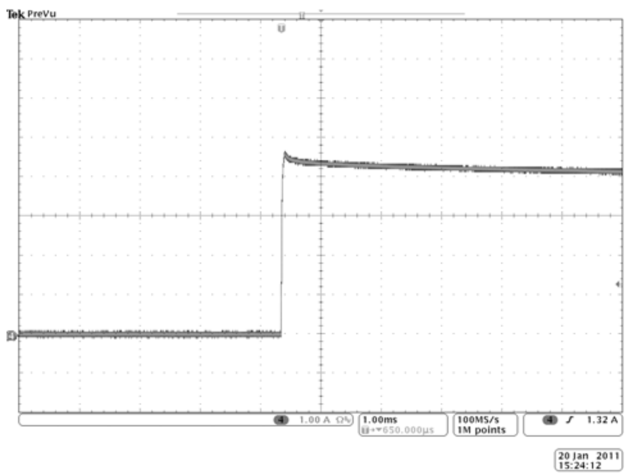


Fig.12 V_{IN} =1.8V, V_{REF}=0.9V Source Short Circuit

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

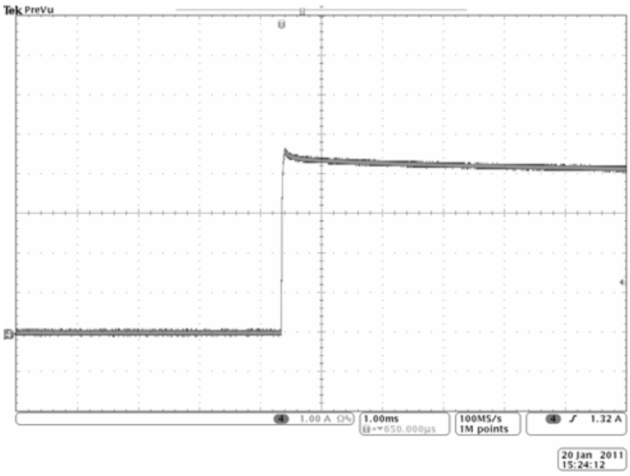


Fig.13 V_{IN} =2.5V, V_{REF}=1.25V Source Short Circuit

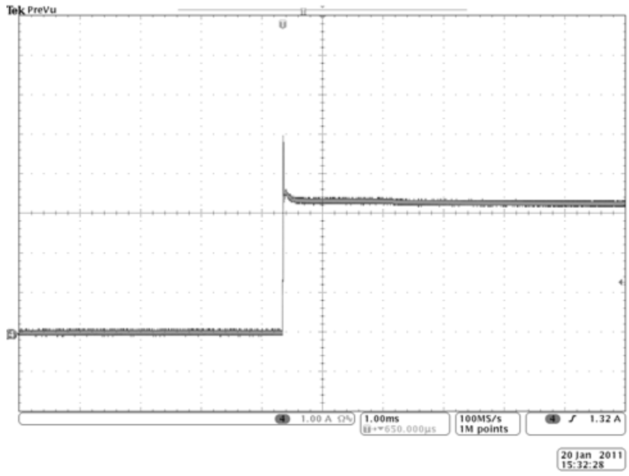


Fig.14 V_{IN} =1.5V, V_{REF}=0.75V Sink Short Circuit

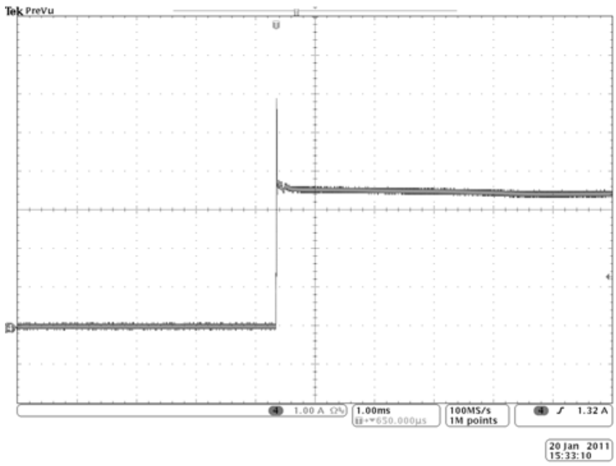


Fig.15 V_{IN} =1.8V, V_{REF}=0.9V Sink Short Circuit

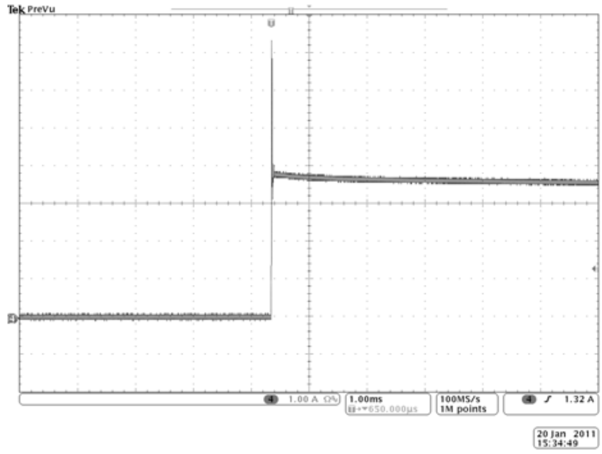
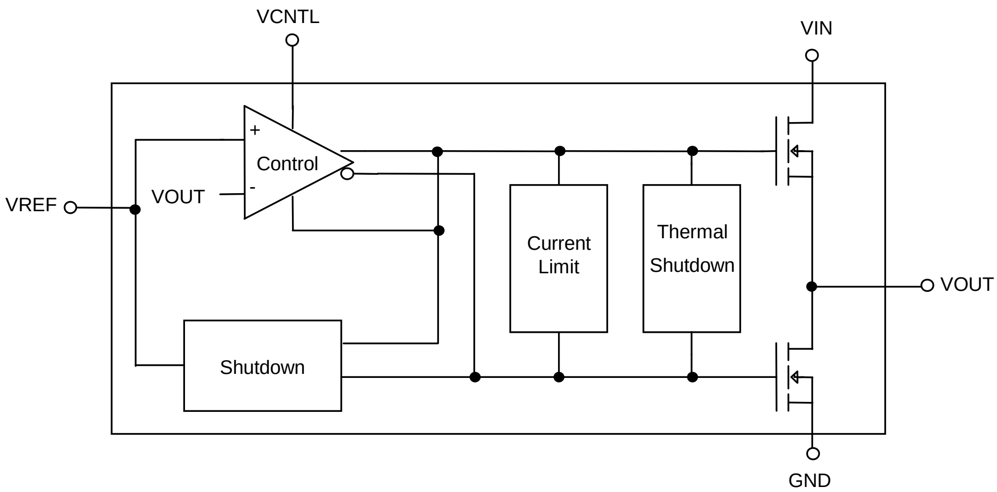


Fig.16 V_{IN} =2.5V, V_{REF}=1.25V Sink Short Circuit

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 47μF ceramic input capacitor and 22μF 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 VCTNL Applications

AIC1385 can be used in an application system where either a 2.5V, 3.3V or 5.0V rail is available. The VCTNL 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:

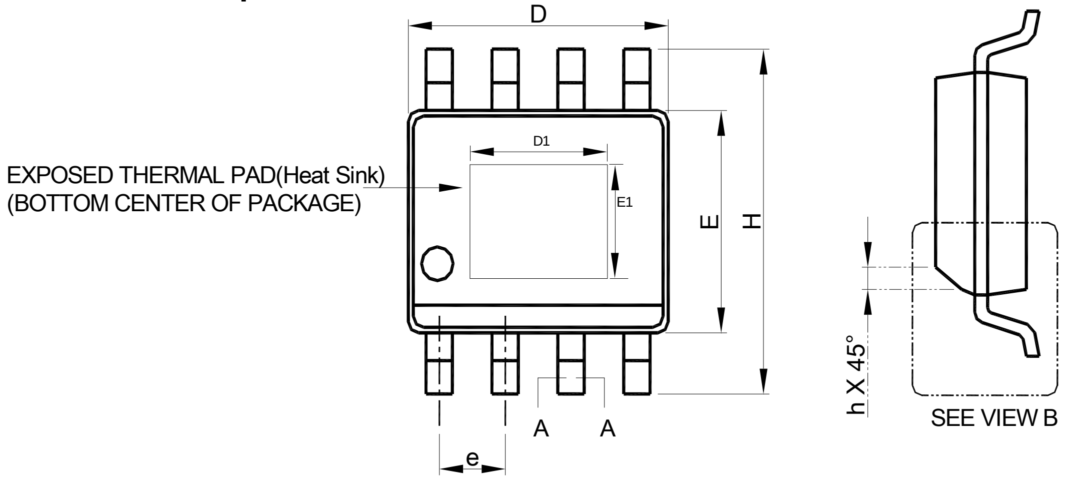
$$P_{D(max)} = [T_{J(max)} - T_A] / \theta_{JA}$$

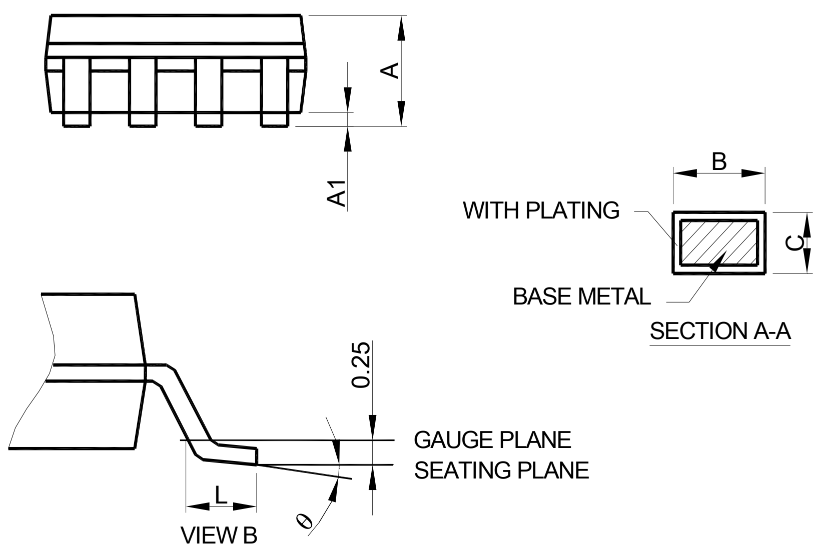
Where $T_{J(max)}$ is the maximum operation junction temperature, T_A is the ambient temperature and the θ_{JA} is the junction to ambient thermal resistance. For recommended operating conditions specification of the AIC1385, the maximum junction temperature is 150°C. The thermal resistance θ_{JA} for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

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

PHYSICAL DIMENSIONS (unit: mm)

- **SOP-8 Exposed Pad**





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°

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.