AME

AME9172M Bus Termination Regulator

■ General Description

The AME9172M is a voltage regulator which could convert the input voltage ranging from 1.5V to 2.5V to an output voltage that user settled. The regulator can provide 2A sourcing or sinking current. The AME9172M used in conjunction with series termination resistors, provides an excellent voltage source for active termination schemes of high speed transmission lines as those seen in high speed memory buses and distributed backplane designs. The AME9172M maintains stable, only requires 10μF (or 10μFx2) of ceramic output capacitance.

The voltage output of the regulator can be used as a termination voltage for DDR SDRAM.

Current limits in both sourcing and sinking mode, plus on-chip thermal shutdown make the circuit tolerant of the output fault conditions.

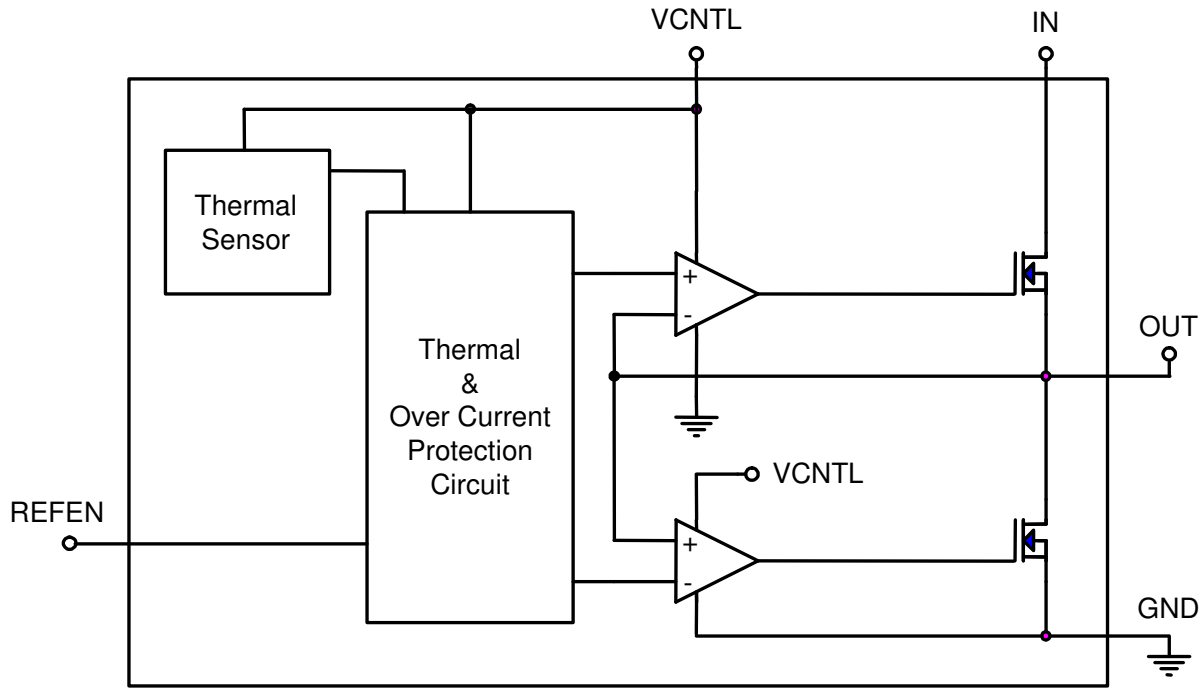
■ Features

- Support All DDR2 (0.9VTT) & DDR3(0.75VTT) Requirements
- Capable of Sourcing and Sinking 2A Current
- Current-limiting Protection
- Thermal Protection
- Integrated Power MOSFETs
- Generates Termination Voltages for SSTL-2
- High Accuracy Output Voltage at Full-Load
- Adjustable VOUT by External Resistors
- Minimum External Components
- Shutdown for Standby or Suspend Mode Operation with High-impedance Output
- All AME′s Lead Free Products Meet RoHS Standards

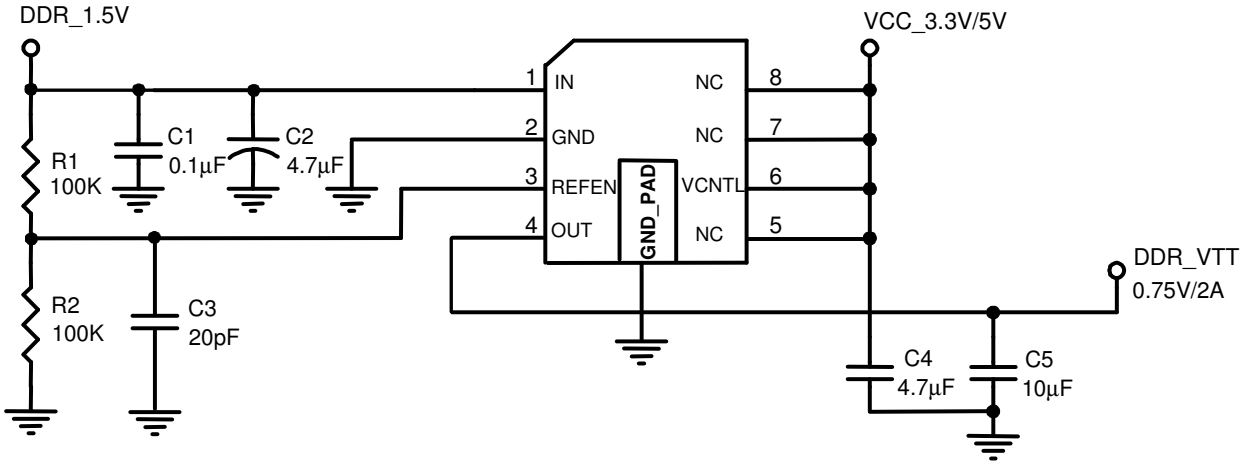
■ Applications

- DDR Memory Termination Supply
- Active Termination Buses
- Desktop PC
- Supply Splitters
- Set Top Box/IPC

■ Function Block Diagram

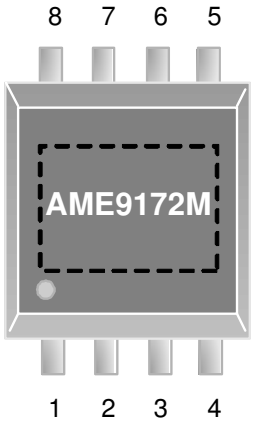


■ Application Circuit



■ Pin Configuration

SOP-8/PP
Top View



AME9172M-AZA

1. IN
2. GND
3. REFEN
4. OUT
5. NC
6. VCNTL
7. NC
8. NC

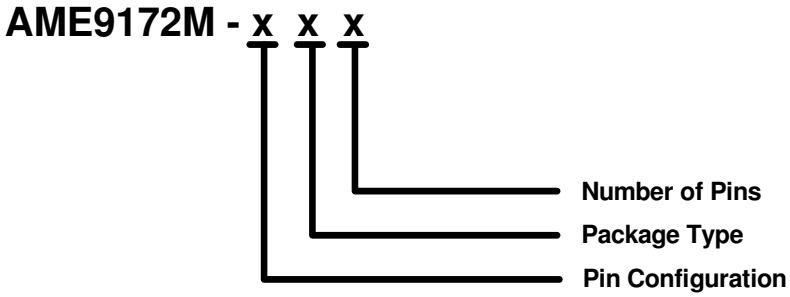
Die Attach:
Conductive Epoxy

Note:
The area enclosed by dashed line represents Exposed Pad and connect to GND.

■ Pin Description

Pin Number	Pin name	Pin Description
1	IN	Power Input
2	GND	Ground
3	REFEN	Input voltage reference & chip enable
4	OUT	Output Voltage
5	NC	No internal connection
6	VCNTL	Driving Voltage
7	NC	No internal connection
8	NC	No internal connection

■ Ordering Information



Pin Configuration	PackageType	Number of Pins
A (SOP-8/PP) 1. IN 2. GND 3. REFEN 4. OUT 5. NC 6. VCNTL 7. NC 8. NC	Z : SOP/PP	A : 8

■ Available Options

Part Number	Marking	Output Voltage	Package	Operating Ambient Temperature Range
AME9172M-AZA	A9172M AOyMXX	N/A	SOP-8/PP	-40°C to +85°C

Note:
1. The first 2 places represent product code. It is assigned by AME such as AO.
2. y is year code and is the last number of a year. Such as the year code of 2008 is 8.
3. A bar on top of first letter represents Green Part such as $\overline{A}$9172M.
4. The last 3 places MXX represent Marking Code. It contains M as date code in "month", XX as LN code and that is for AME internal use only. Please refer to date code rule section for detail information.
5. Please consult AME sales office or authorized Rep./Distributor for the availability of output voltage and package type.

■ Absolute Maximum Ratings

Parameter	Symbol	Maximum	Unit
Input Voltage. VIN to GND	V_{IN}	6	V
ESD Classification	B*		

Caution: Stress above the listed absolute maximum rating may cause permanent damage to the device.

* HBM B: 2000V~3999V

■ Recommended Operating Conditions

Parameter	Symbol	Rating	Unit
Supply Voltage to VIN	V_{IN}	(1.5 to 2.5) ± 3%	V
Supply Voltage to VCNTL	VCNTL	(3.3 or 5) ± 5%	V
Output Current of VOUT Pin *	$*I_{OUT}$	-2 to 2	A
Junction Temperature Range	T_J	-40 to +150	°C
Storage Temperature Range	T_{STG}	-65 to +150	°C
Ambient Temperature Range	T_A	-40 to +85	°C

* The symbol "+" means the VOUT sources current to load; the symbol "-" means the VOUT sinks current to GND

■ Thermal Characteristics

Parameter	Package	Die Attach	Symbol	Maximum	Unit
Thermal Resistance* (Junction to Case)	SOP-8/PP	Conductive Epoxy	θ_{JC}	19	°C / W
Thermal Resistance (Junction to Ambient)			θ_{JA}	84	
Internal Power Dissipation			P_D	1450	mW
Solder Iron (10Sec)**				350	°C

*Measure θ_{JC} on backside center of Exposed Pad.

** MIL-STD-202G 210F

■ Electrical Specifications

Limits in standard typeface are for T_A = 25°C, unless otherwise specified:
DDR3 => V_{IN} = 1.5V, V_{CNTL} = 3.3V, V_{REFEN} = 0.5V_{IN}

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
Output Offset Voltage	V_{OS}	I_{OUT} = 0A (Note 1)	-20	0	20	mV
Load Regulation (DDR 2 / 3)	V_{LOAD}	I_L = 0 to 2A	-20	0	20	mV
		I_L = 0 to -2A	-20	0	20	
Operating Current of V_{CNTL}	I_{CNTL}	No Load		0.5	1.5	mA
Short Circuit Protection						
DDR 2 / 3 Current Limit	I_{LIMIT}		2.0		4	A
Over Temperature Protection						
Thermal Shutdown Temperature	T_{SD}	V_{CNTL}= 3.3V or 5V		170		°C
Thermal Shutdown Hysteresis		Guaranteed by design		30	50	
Shutdown Threshold	V_{IH}	Enable	0.5			V
	V_{IL}	Shutdown			0.2	
POR Threshold	V_{CNTL_TH}	Rising Level		2.7	2.9	V
POR Hysteresis	V_{CNTL_HYS}			0.2		V
Short Circuit (Note 2)	I_{SC_VIN}	Sinking	1.5			A
	I_{SC_GND}	Sourcing	1			
Shutdown Current of V_{CNTL}	I_{CNTL_SD}	V_{REFEN}=0V, I_{OUT}=0V (Fig 3)		50	90	μA

Note1: V_{OS} offset is the voltage measurement defined as V_{OUT} subtracted from V_{REFEN}.
Note2: When testing short-circuit, V_{OUT} must be lower than 0.4V.

■ Test Circuit

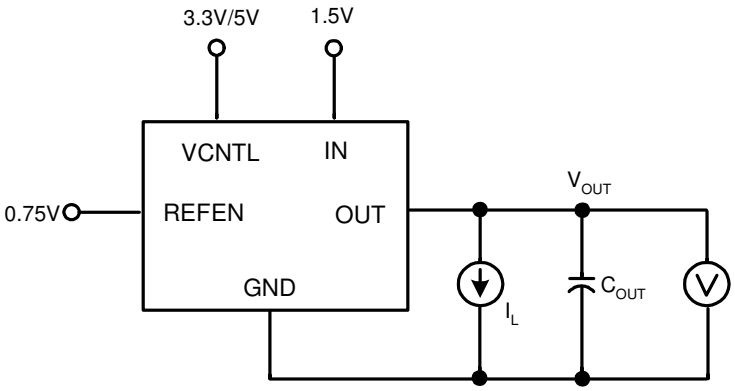


Fig 2: Output Voltage Tolerance, ΔV_{OUT}

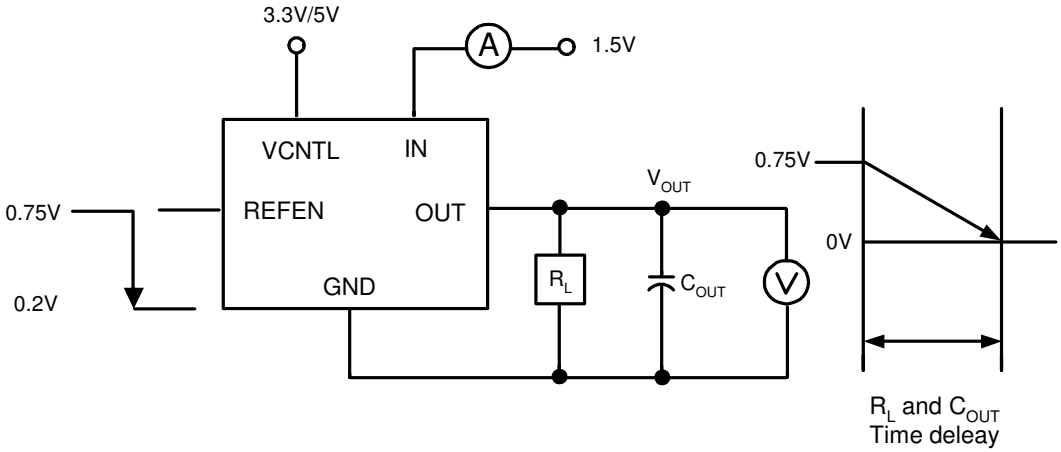


Fig 3: Current in Shutdown Mode, I_{SHDN}

■ Test Circuit

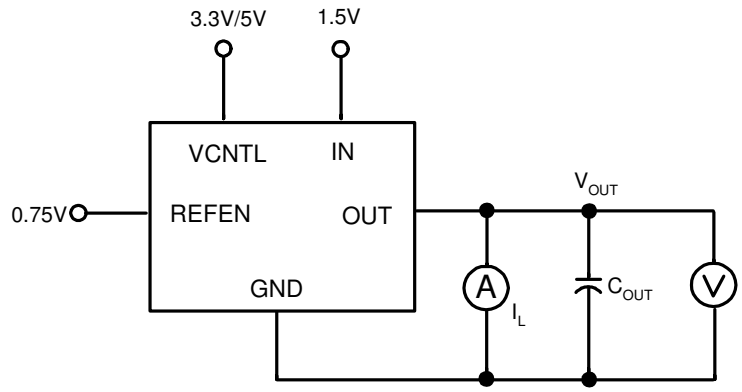


Fig 4: Current Limit for High Side, I_{CLHIGH}

Power Supply with Current Limit

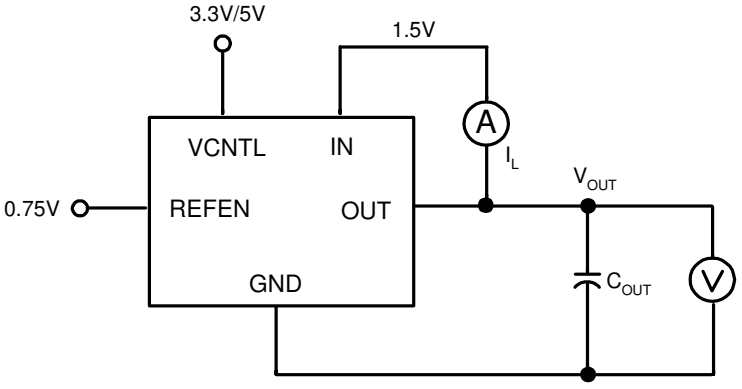
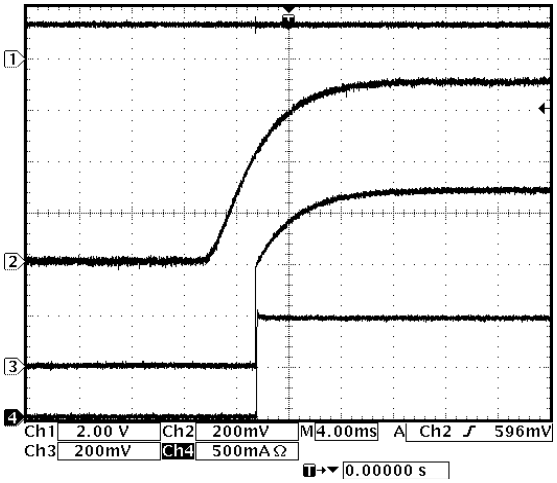


Fig 5: Current Limit for Low Side, I_{CLLOW}

■ Characterization Curve (For reference only)

Enable On From V_{REF}

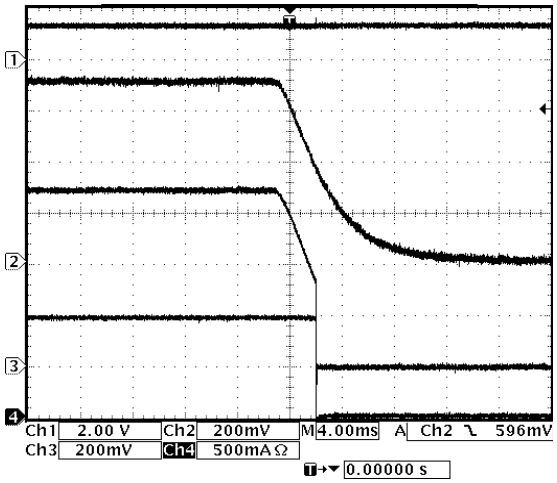
V_{IN}=1.4V, V_{CNTL}=5.0V
V_{REF} = 0.5V_{IN}, I_{OUT} = 1A



Ch1= V_{IN} , Ch2= V_{REF}
Ch3= V_{OUT} , Ch4= I_{OUT}

Enable Off From V_{REF}

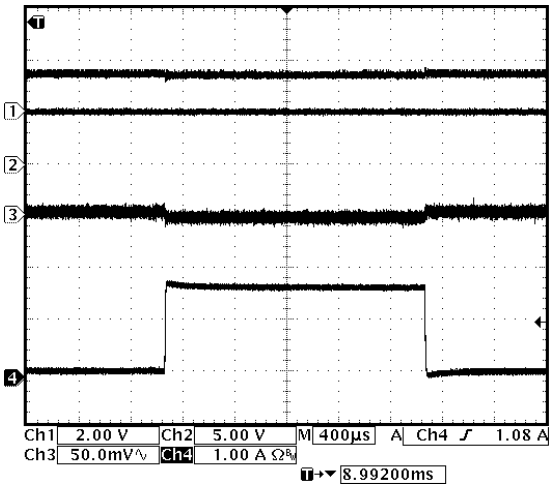
V_{IN}=1.4V, V_{CNTL}=5.0V
V_{REF} = 0.5V_{IN}, I_{OUT} = 1A



Ch1= V_{IN} , Ch2= V_{REF}
Ch3= V_{OUT} , Ch4= I_{OUT}

Dynamic Load

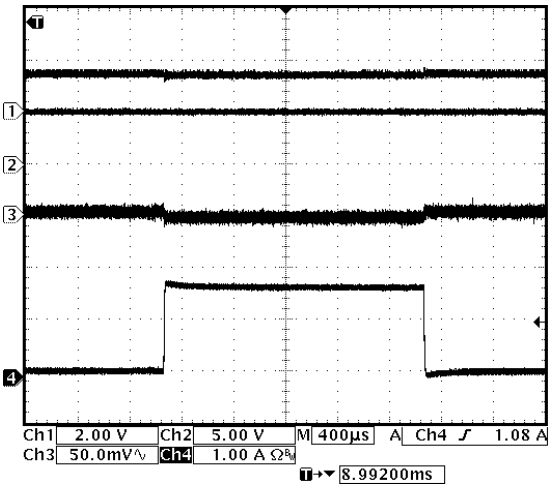
Frequency=2.5KHZ, V_{IN}=1.4V
I_{OUT} = 0.1A~1.8A and 1.8A~0.1A
V_{CNTL}=5.0V, Source



Ch1= V_{IN} , Ch2= V_{CNTL}
Ch3= V_{OUT} , Ch4= I_{OUT}

Dynamic Load

Frequency=2.5KHZ, V_{IN}=1.8V
I_{OUT} = 0.1A~1.8A and 1.8A~0.1A
V_{CNTL}=5.0V, Source

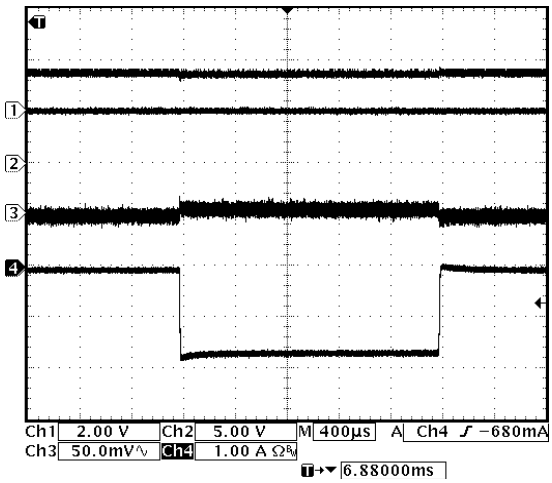


Ch1= V_{IN} , Ch2= V_{CNTL}
Ch3= V_{OUT} , Ch4= I_{OUT}

■ Characterization Curve (For reference only)

Dynamic Load

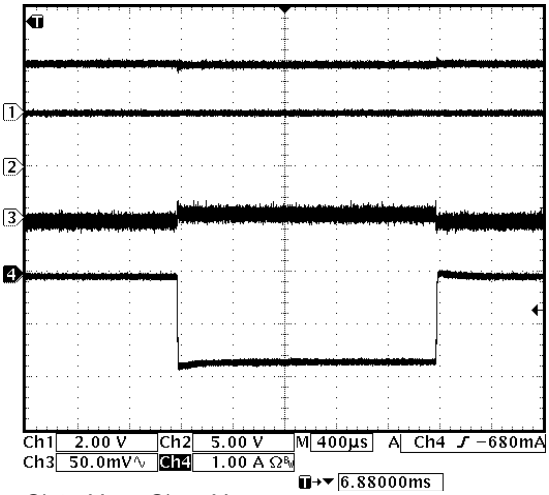
Frequency=2.5KHZ, V_{IN}=1.4V
I_{OUT} = 0.1A~1.8A and 1.8A~0.1A
V_{CNTL}=5.0V, Sink



Ch1= V_{IN} , Ch2= V_{CNTL}
Ch3= V_{OUT} , Ch4= I_{OUT}

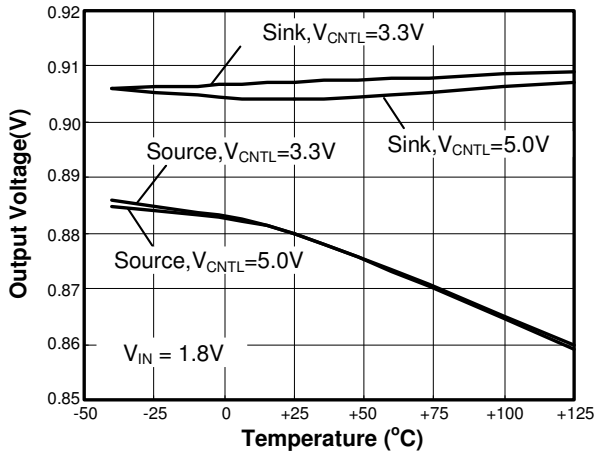
Dynamic Load

Frequency=2.5KHZ, V_{IN}=1.8V
I_{OUT} = 0.1A~1.8A and 1.8A~0.1A
V_{CNTL}=5.0V, Sink

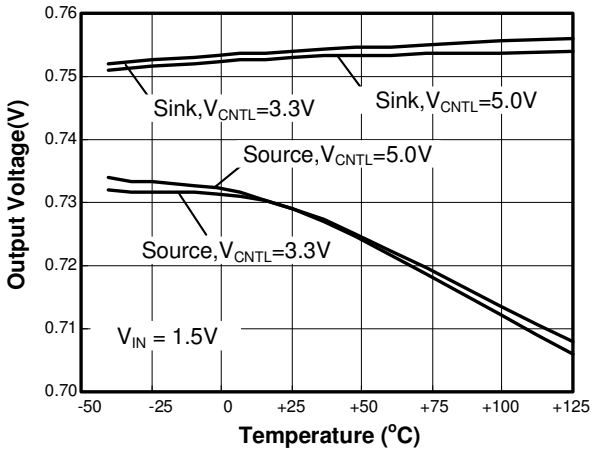


Ch1= V_{IN} , Ch2= V_{CNTL}
Ch3= V_{OUT} , Ch4= I_{OUT}

Output Voltage vs Temperature

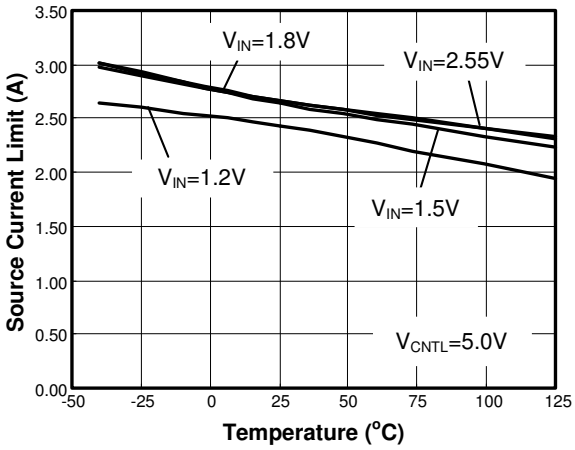


Output Voltage vs Temperature

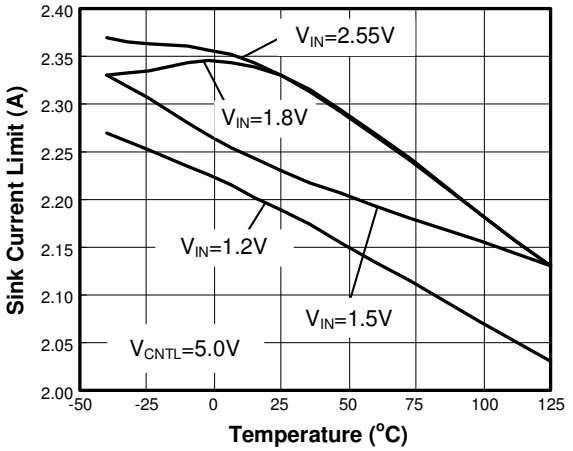


■ Characterization Curve(For reference only)

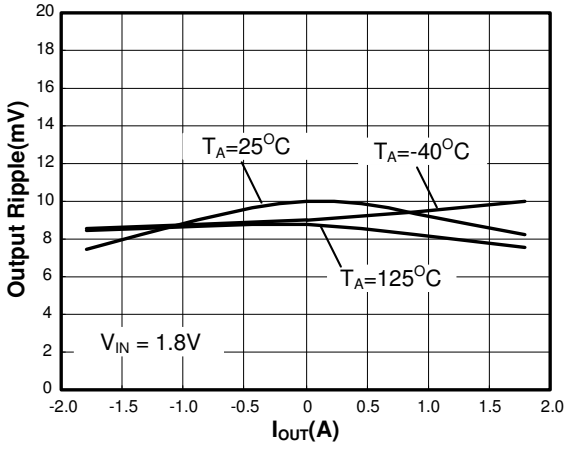
Source Current Limit vs Temperature



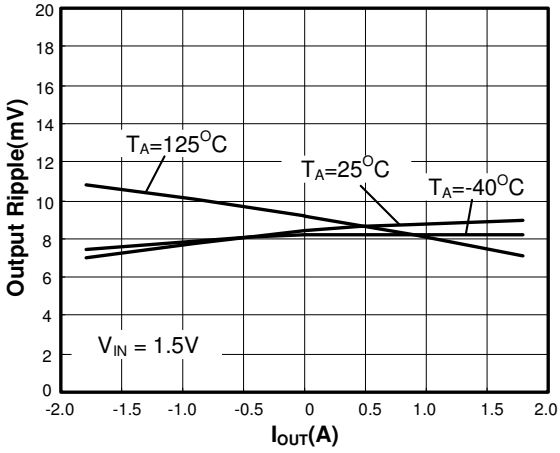
Sink Current Limit vs Temperature



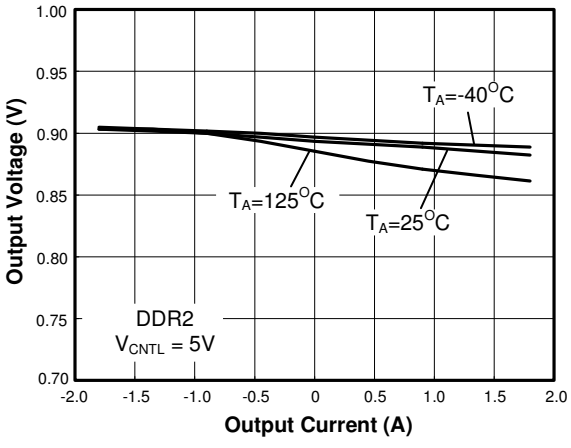
Output Ripple vs Temperature



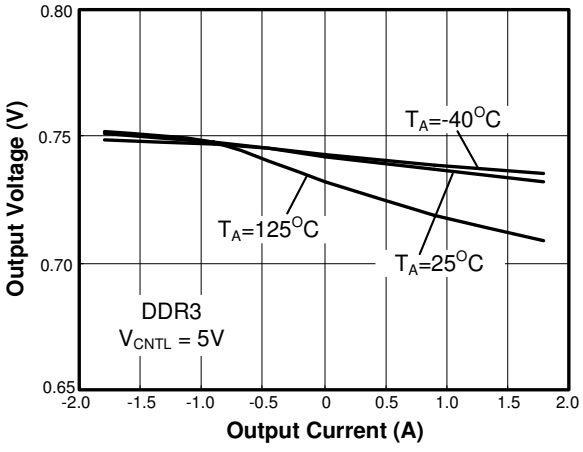
Output Ripple vs Temperature



Output Voltage vs Output Current



Output Voltage vs Output Current

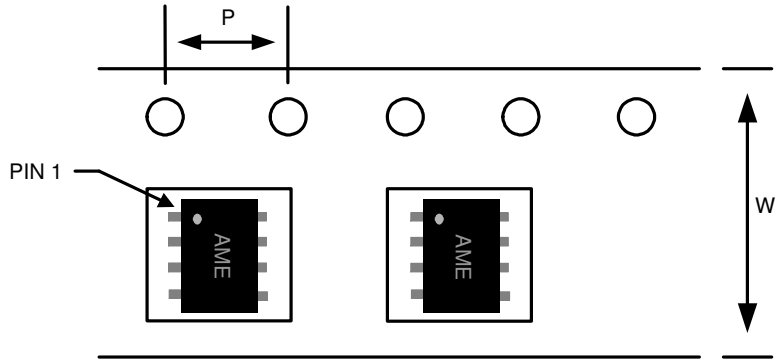


■ Date Code Rule

Month Code	
1: January	7: July
2: February	8: August
3: March	9: September
4: April	A: October
5: May	B: November
6: June	C: December

■ Tape and Reel Dimension

SOP-8/PP

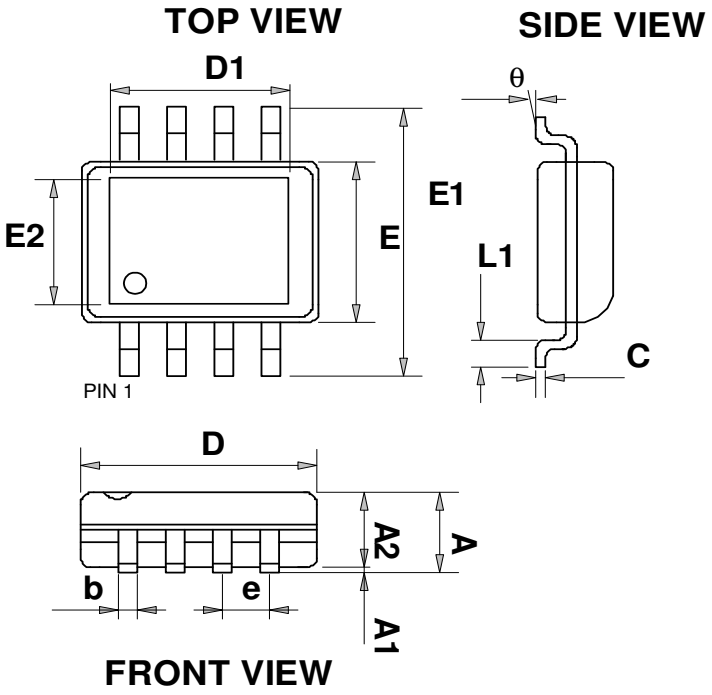


Carrier Tape, Number of Components Per Reel and Reel Size

Package	Carrier Width (W)	Pitch (P)	Part Per Full Reel	Reel Size
SOP-8/PP	12.0±0.1 mm	4.0±0.1 mm	2500pcs	330±1 mm

■ Package Dimension

SOP-8/PP



SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.350	1.750	0.053	0.069
A1	0.000	0.150	0.000	0.006
A2	1.350	1.600	0.053	0.063
C	0.100	0.250	0.004	0.010
E	3.750	4.150	0.148	0.163
E1	5.700	6.300	0.224	0.248
L1	0.300	1.270	0.012	0.050
b	0.310	0.510	0.012	0.020
D	4.720	5.120	0.186	0.202
e	1.270 BSC		0.050 BSC	
θ	0°	8°	0°	8°
E2	2.150	2.513	0.085	0.099
D1	2.150	3.402	0.085	0.134

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