

## 3A Bus Terminator Regulator

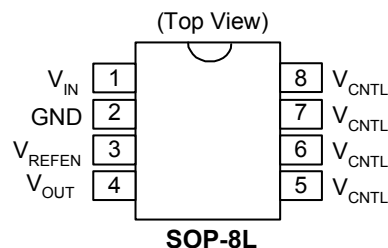
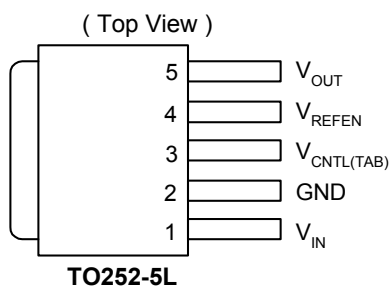
### ■ Features

- Ideal for DDR-I and DDR-II applications
- Capable of sourcing and sinking current 1.5A/3A
- Current limiting protection
- Thermal protection
- Current-shoot-through protection
- High accuracy output voltage at full load
- Minimum external components
- Adjustable V<sub>OUT</sub> by external resistors
- Shutdown for standby or suspend mode operation with high-impedance output
- TO252-5 and SOP-8 **Pb-free** Package

### ■ Applications

- Mother Board DDR-SDRAM Termination
- Mother Board DDR-II Termination
- Game / Play Station
- Set Top Box
- PCI / AGP Graphics
- IPC
- SCSI-III Bus Termination

### ■ Pin Assignment



### ■ General Description

AP1128 is a linear regulator designed as a cost-effective solution for active termination of DDR SDRAM. The converting voltage range is from 1.6V to 6V into a desired output voltage, which is adjusted by two external resistors. The current sourcing and sinking capability of the regulator is up to 1.5A/3A while the output voltage within 2%/3%.

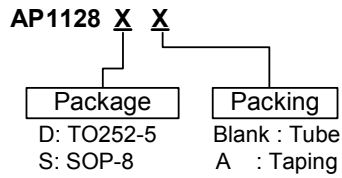
This device provides on-chip thermal shutdown and current limit functions for circuit tolerance of the output fault conditions. SO-8 and TO-252-5L packages are available for all commercial and industrial surface mount applications.

### ■ Pin Descriptions

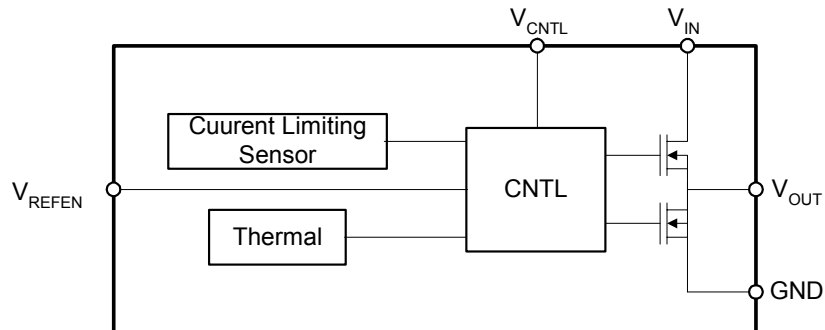
Pin Name	Descriptions
V <sub>IN</sub>	Power Input
V <sub>CNTL</sub>	Gate Drive Voltage
V <sub>REFEN</sub>	Reference Voltage Input and Chip Enable
GND	Ground
V <sub>OUT</sub>	Output Voltage

## 3A Bus Terminator Regulator

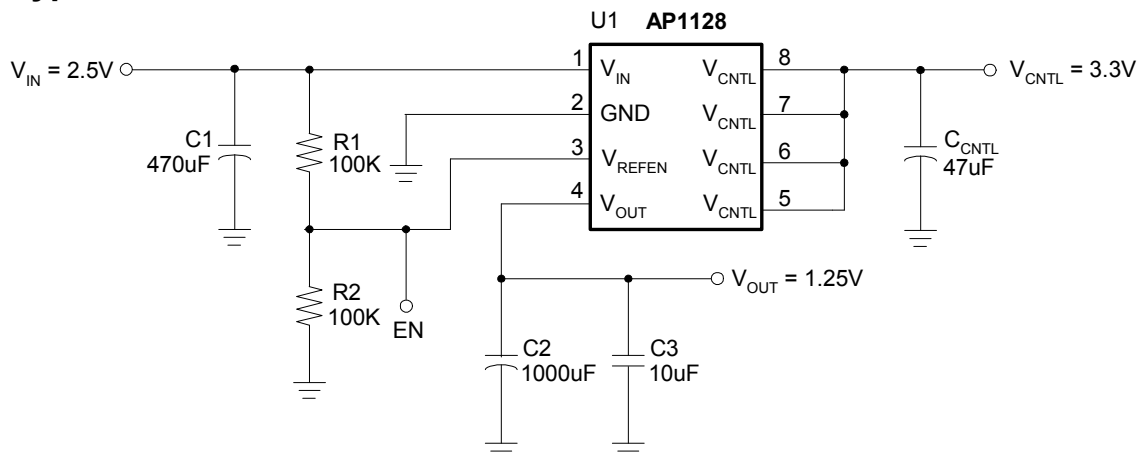
### Ordering Information



### Block Diagram



### Typical Circuit



### Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit	
$V_{IN}$	Power Input Voltage	6	V	
$P_D$	Power Dissipation	internal limited		
	HBM ESD Rating	3	KV	
$T_{STG}$	Storage Temperature	-55 to 150	°C	
$T_{Lead}$	Lead Temperature (Soldering 5 sec)	260	°C	
$\theta_{JC}$	Thermal Resistance	SOP-8 (Note 3)	20	°C/W
		TO252-5	6	
$\theta_{JA}$	Thermal Resistance	SOP-8	80	°C/W
		TO252-5	40	

## 3A Bus Terminator Regulator

### ■ Electrical Characteristics

$V_{IN} = +2.5V$ ,  $V_{CNTL} = +3.3V$ ,  $V_{REFEN} = +1.25V$ ,  $C_{OUT} = 10\mu F$  (Ceramic)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$V_{OS}$	Output Offset Voltage (Note 1)	$I_{OUT}=0A$	-20	-5	20	mV
$ \Delta V_{LOAD} $	Load Regulation	$I_L: 0A \rightarrow 1.5A$	-	0.5	2	%
		$I_L: 0A \rightarrow -1.5A$	-	0.5	2	
$V_{IN}$	Input Voltage Range (DDR I/II) (Note2)	$V_{CNTL} \geq V_{IN}$	1.6	2.5/1.8	-	V
$V_{CNTL}$	Gate Drive Voltage Range (Note2)	$V_{CNTL} \geq V_{IN}$	-	3.3	6	V
$I_{CNTL}$	Operation Current of $V_{CNTL}$	$I_{OUT} = 0A$	-	3	6	mA
$I_{SHDN}$	Current in Shutdown	$V_{REFEN} < 0.2V$ , $R_L = 180\Omega$	-	10	90	$\mu A$
$I_Q$	Quiescent Current	$I_{OUT}=0A$	-	1	3	mA
<b>Short Circuit Protection</b>						
$I_{LIMIT}$	Current Limit	SOP-8	-	2	-	A
		TO-252	-	3	-	
<b>Over Temperature Protection</b>						
$T_{OS}$	Thermal Shutdown Temperature	$3.3V \leq V_{CNTL} \leq 5V$	-	140	-	$^{\circ}C$
<b>Shutdown Function</b>						
	Shutdown Threshold Trigger	Output = High	0.8	-	-	V
	Shutdown Threshold Trigger	Output = Low	-	-	0.2	

**Note 1:**  $V_{OS}$  is the voltage measurement  $V_{OUT}$  subtracted from  $V_{REFEN}$ .

**Note 2:** Keep  $V_{CNTL} \geq V_{IN}$  at power on/off sequences.

**Note 3:** Surface mounted on 1 in<sup>2</sup> copper pad of FR4 board

### ■ Typical Performance Characteristics

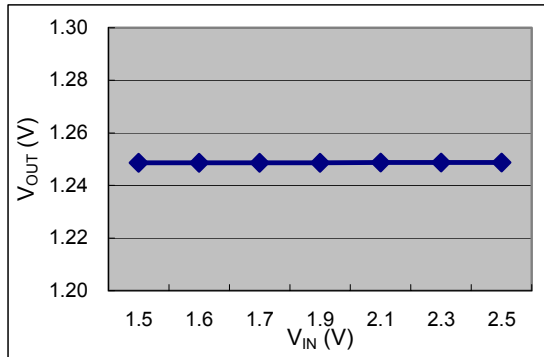


Fig 1. Line Regulation ( $V_{IN}$  v.s.  $V_{OUT}$ )

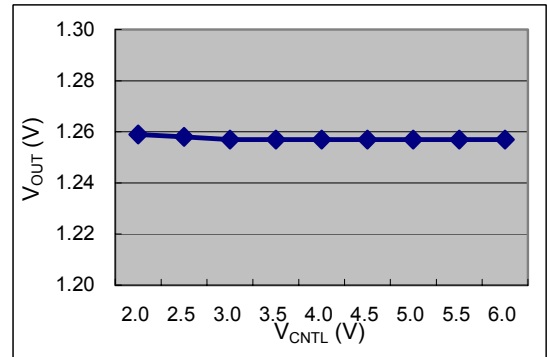


Fig 2. Line Regulation ( $V_{CNTL}$  v.s.  $V_{OUT}$ )

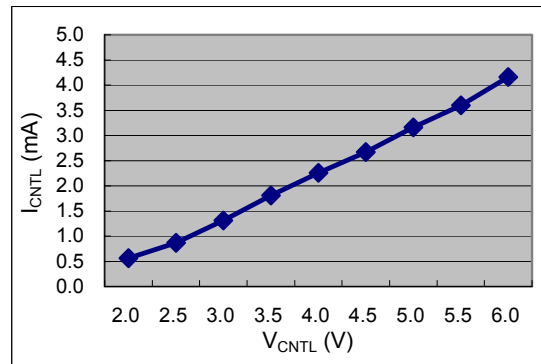


Fig 3. Line Regulation ( $V_{CNTL}$  v.s.  $I_{CNTL}$ )

### ■ Typical Performance Characteristics (Continued)

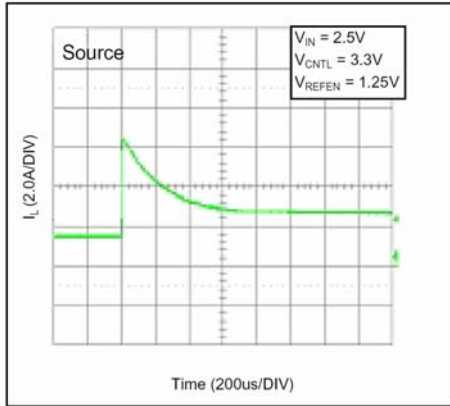


Fig 4. Output Short-Circuit Protection

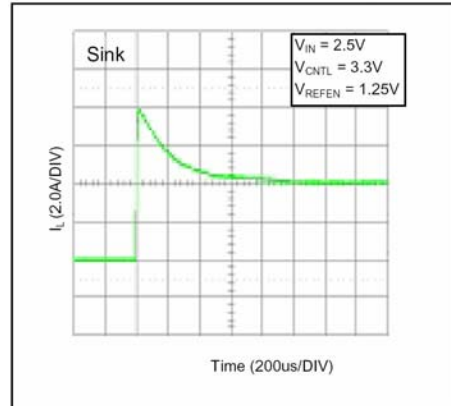
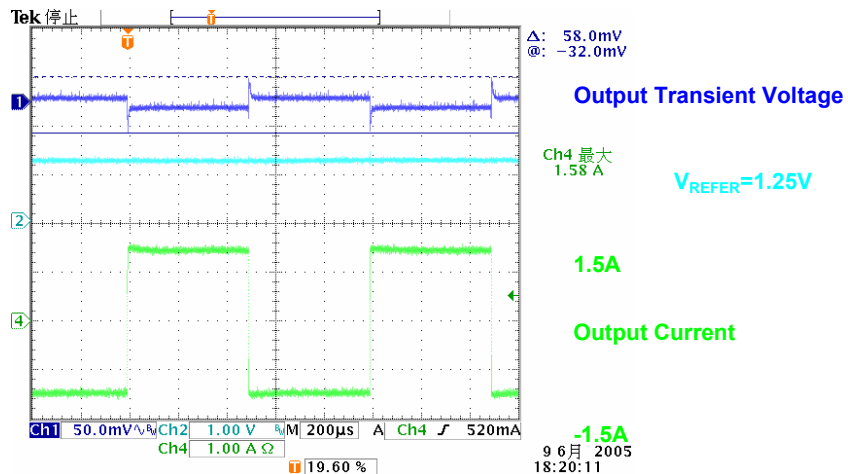
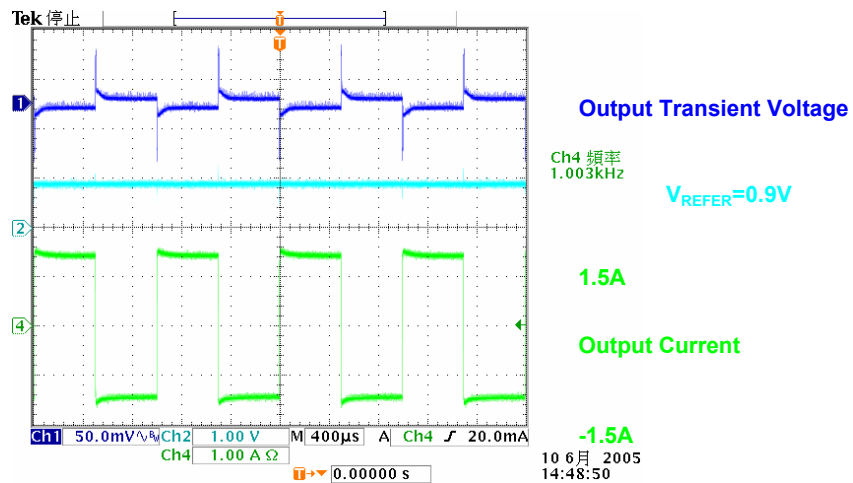


Fig 5. Output Short-Circuit Protection



$V_{IN}=2.5V$ ,  $V_{CNLT}=3.3V$ ,  $V_{REFEN}=1.25V$ ,  $Temp(IC\ Body) = 98^{\circ}C$   
Fig 7. Transient Response



$V_{IN}=1.8V$ ,  $V_{CNLT}=3.3V$ ,  $V_{REFEN}=0.9V$   
Fig 8. Transient Response

### ■ Typical Performance Characteristics (Continued)

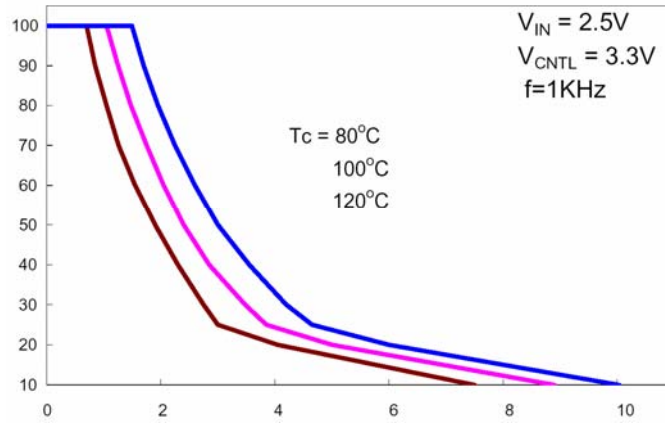
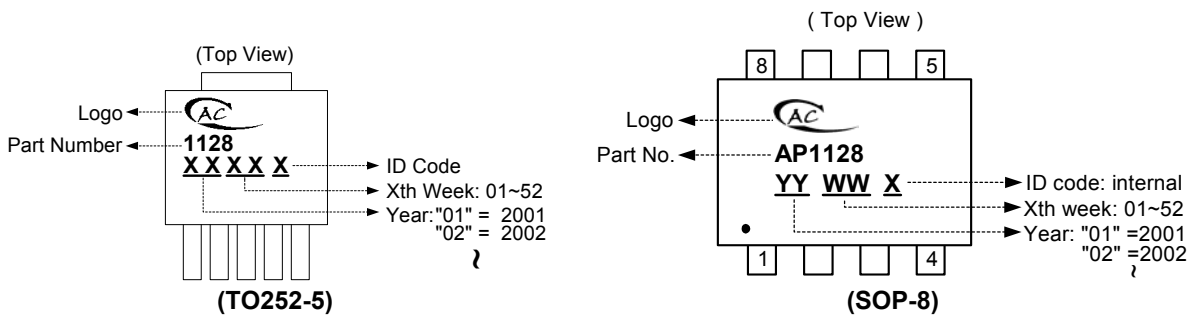


Fig 9. Safe Operating Area

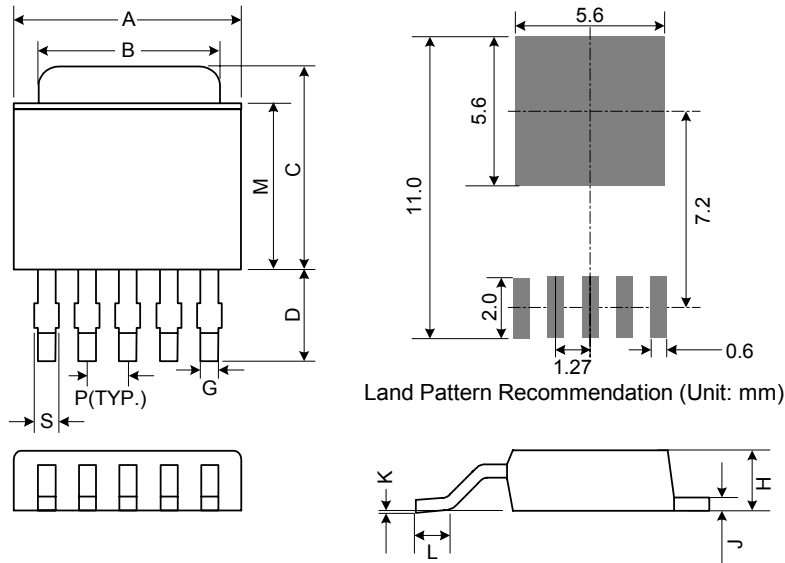
### ■ Marking Information



## 3A Bus Terminator Regulator

### ■ Package Information

(1) Package Type: TO252-5

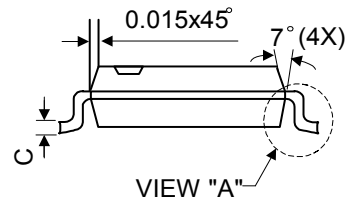
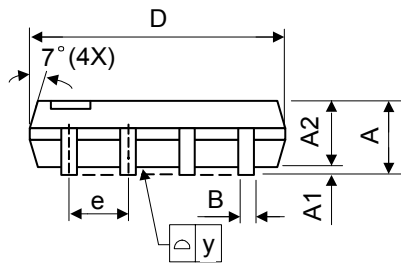
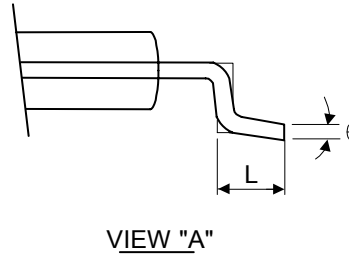
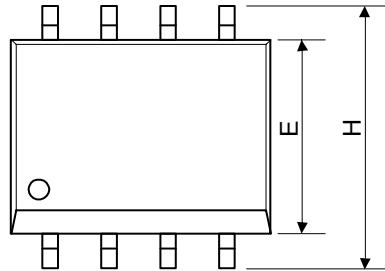


Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	6.35	6.60	6.85	0.250	0.260	0.270
B	5.20	5.35	5.50	0.205	0.211	0.217
C	6.80	7.00	7.30	0.268	0.276	0.287
D	2.20	2.50	2.80	0.087	0.098	0.110
P	1.27 REF.			0.050 REF.		
S	0.50	0.65	0.80	0.020	0.026	0.031
G	0.40	0.50	0.63	0.016	0.020	0.025
H	2.20	2.30	2.40	0.087	0.091	0.094
J	0.45	0.52	0.58	0.018	0.020	0.023
K	0.00	0.08	0.15	0.000	0.003	0.006
L	0.90	1.20	1.63	0.035	0.047	0.064
M	5.40	5.80	6.20	0.213	0.228	0.244

## 3A Bus Terminator Regulator

### ■ Package Information (Continued)

(2) Package Type: SOP-8



Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	1.40	1.60	1.75	0.055	0.063	0.069
A1	0.10	-	0.25	0.040	-	0.100
A2	1.30	1.45	1.50	0.051	0.057	0.059
B	0.33	0.41	0.51	0.013	0.016	0.020
C	0.19	0.20	0.25	0.0075	0.008	0.010
D	4.80	5.05	5.30	0.189	0.199	0.209
E	3.70	3.90	4.10	0.146	0.154	0.161
e	-	1.27	-	-	0.050	-
H	5.79	5.99	6.20	0.228	0.236	0.244
L	0.38	0.71	1.27	0.015	0.028	0.050
y	-	-	0.10	-	-	0.004
$\theta$	$0^\circ$	-	$8^\circ$	$0^\circ$	-	$8^\circ$