

# Not Recommended for New Design



## AP451

### 2 Channel Linear Controller with Independent Enable Function

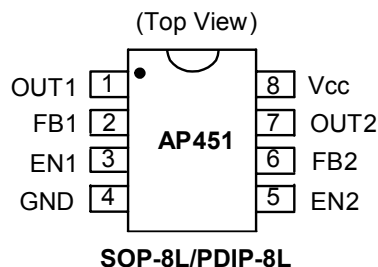
#### ■ Features

- 2 channel linear control Circuitries
- Operating voltage can be up to 18V
- Under Voltage Lockout (UVLO) Protection
- Current limit external BJT only
- Independent enables function
- Low ESR output capacitor (Multi-layer chip capacitor (MLCC)) application
- Adjustable output voltage by external resistors
- 0.8V voltage reference Output
- NPN or N-channel MOSFET driving capability
- 8-pin SOP, PDIP **Pb-Free** packages

#### ■ Applications

- LCD Monitor/TV
- XDRom, XDSL Product
- M/B, VGA

#### ■ Pin Assignment



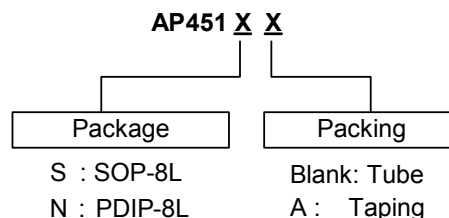
#### ■ General Description

The AP451 integrates two channel linear controllers into a single chip, mainly designs for power-supply regulator. All the functions included an on-chip 0.8V reference output, an error amplifier, UVLO, current limit. During low VCC situation, the UVLO makes sure that the outputs are off until the internal circuit is operational normally.

#### ■ Pin Descriptions

Pin Name	Pin No.	Description
OUT1	1	Linear Controller CH1output
FB1	2	Channel 1 Voltage Feedback
EN1	3	Channel 1 Enable Pin
GND	4	Signal Ground
EN2	5	Channel 2 Enable Pin
FB2	6	Channel 2 Voltage Feedback
OUT2	7	Linear Controller CH2 output
Vcc	8	Supply Voltage

#### ■ Ordering Information



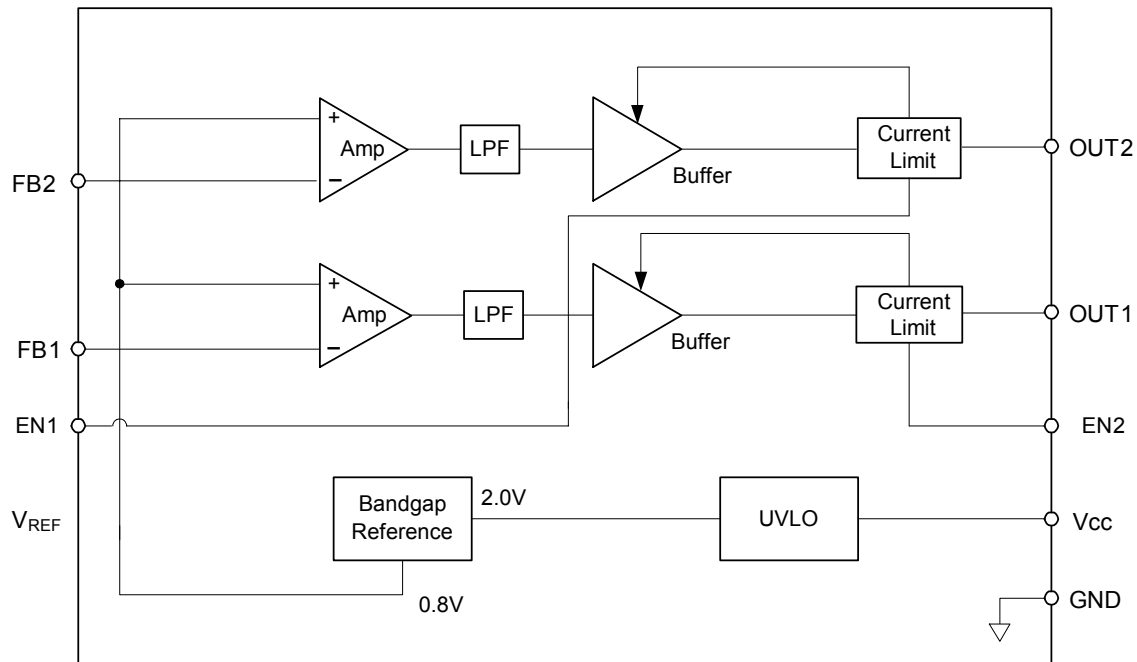
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## 2 Channel Linear Controller with Independent Enable Function

### ■ Block Diagram



### ■ Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit
$V_{CC}$	Supply Voltage	19	V
$V_{EN}$	Enable Pin Voltage	18	V
$V_{O1} / V_{O2}$	CH1 / CH2 Linear Driver Voltage to Ground	$-0.3 \leq V \leq 18$	V
$T_{OP}$	Operating Temperature Range	-20 to +85	$^{\circ}C$
$T_{ST}$	Storage Temperature Range	-65 to +150	$^{\circ}C$
$T_{LEAD}$	Lead Temperature 1.6 mm (1/16 inch) from Case for 10 Seconds	260	$^{\circ}C$

### ■ Recommended Operating Conditions

Symbol	Parameter	Min.	Max.	Unit
$V_{CC}$	Supply Voltage	3.0	18	V
$V_{EN}$	Enable Pin Voltage	According to $V_{CC}$		V
$V_{O1} / V_{O2}$	CH1 / CH2 Linear Driver Voltage to Ground	-	$V_{CC}-1.5$	V
$I_{FB}$	Current into Feedback Terminal	-	45	$\mu A$
$R_F$	Feedback Resistor	100	-	$k\Omega$
$T_{OP}$	Operating Free-air Temperature	-20	85	$^{\circ}C$

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#### Electrical Characteristics ( $T_A=25^{\circ}\text{C}$ , $V_{CC}=6\text{V}$ )

##### Reference (REF)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$V_{OUT1/2}$	$V_{O1}$ / $V_{O2}$ Connect to FB1 / FB2		0.784	0.800	0.816	V
	Output Voltage Change with Temperature	$T_A = -20^{\circ}\text{C} \sim 25^{\circ}\text{C}$	-	-0.1	$\pm 1$	%
		$T_A = 25^{\circ}\text{C} \sim 85^{\circ}\text{C}$	-	-0.2	$\pm 1$	%

##### Under voltage lockout (UVLO)

$V_{UT}$	Upper Threshold Voltage ( $V_{CC}$ )	$I_{O(REF)} = 0.1\text{mA}$ $T_A = 25^{\circ}\text{C}$	-	2.1	-	V
$V_{LWT}$	Lower Threshold Voltage ( $V_{CC}$ )		-	2.0	-	V
$V_{HT}$	Hysteresis ( $V_{CC}$ )		-	100	-	mV

##### Output section

$I_{CL1}$	CH1 Current Limit	$V_{CC}=5\text{V}$ , $V_{NOUT2}=V_{FB2}=0\text{V}$	25	-	-	mA
$I_{CL2}$	CH2 Current Limit	$V_{CC}=5\text{V}$ , $V_{NOUT3}=V_{FB3}=0\text{V}$	25	-	-	mA

##### Enable function

$V_{IH}$	EN Pin Logic Input Threshold	High (regulator ON)	2.0	1.3	-	V
$V_{IL}$	Voltage for EN1/2	Low (regulator OFF)	-		0.6	V
$I_{IH}$	EN pin Logic Input Current for EN1/2	High (regulator ON)	-	10	-	$\mu\text{A}$
$I_{IL}$		Low (regulator OFF)	-	-10	-	$\mu\text{A}$

##### Total device

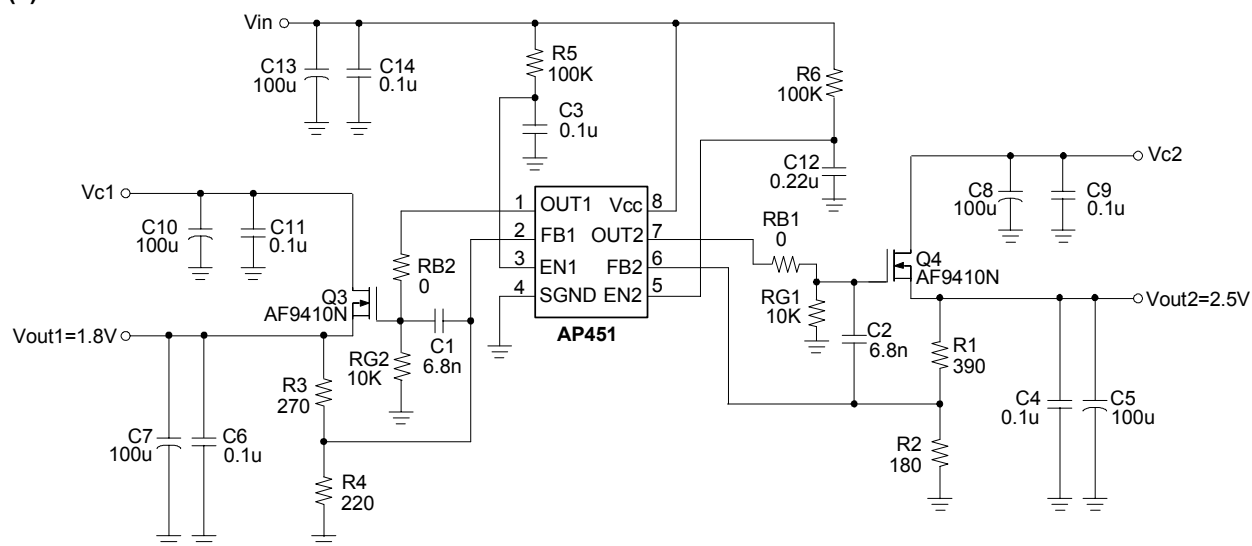
$I_{CCA}$	Average Supply Current		-	4	6	mA
$I_{SD}$	Shutdown Current		-	180	500	$\mu\text{A}$

##### Thermal Resistor

$\theta_{JA}$	Thermal Resistor Junction to Ambient	SOP8	-	120	-	$^{\circ}\text{C/W}$
		PDIP8	-	90	-	$^{\circ}\text{C/W}$

#### Typical Application Circuit

##### (1) MOSFET



$$V_{out1} = V_{FB1} \times \left( 1 + \frac{R3}{R4} \right); \quad V_{out2} = V_{FB2} \times \left( 1 + \frac{R1}{R2} \right)$$

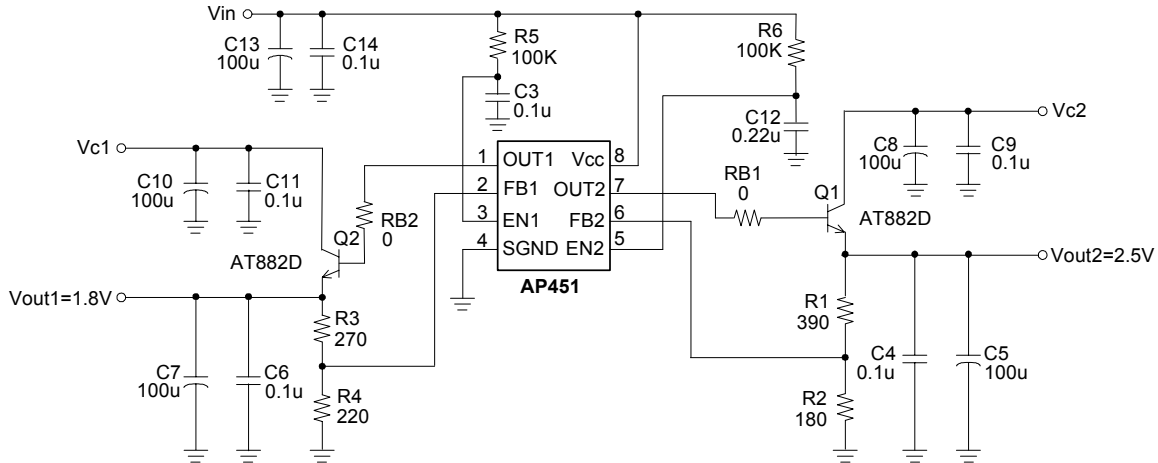
$R1$  and  $R3 = 180 \sim 2\text{K}\Omega$



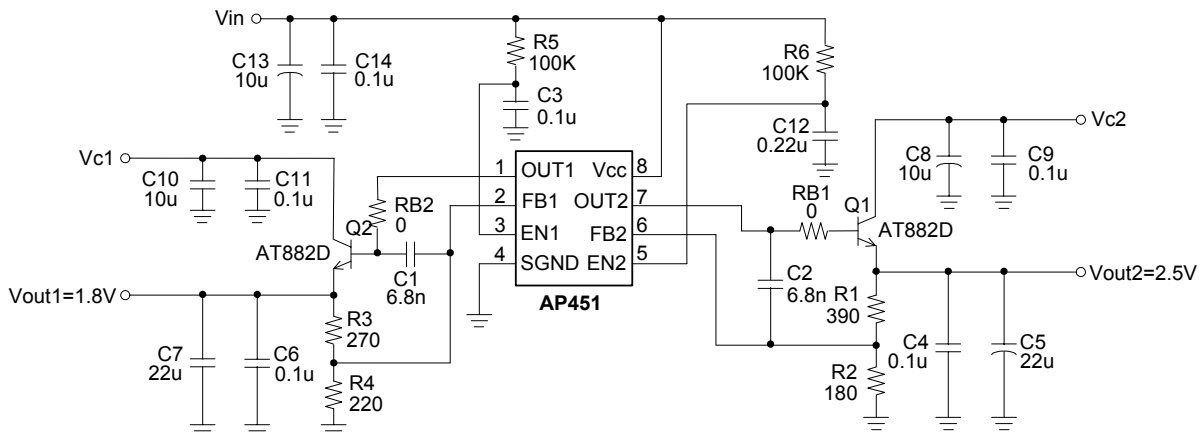
### 2 Channel Linear Controller with Independent Enable Function

#### ■ Typical Application Circuit

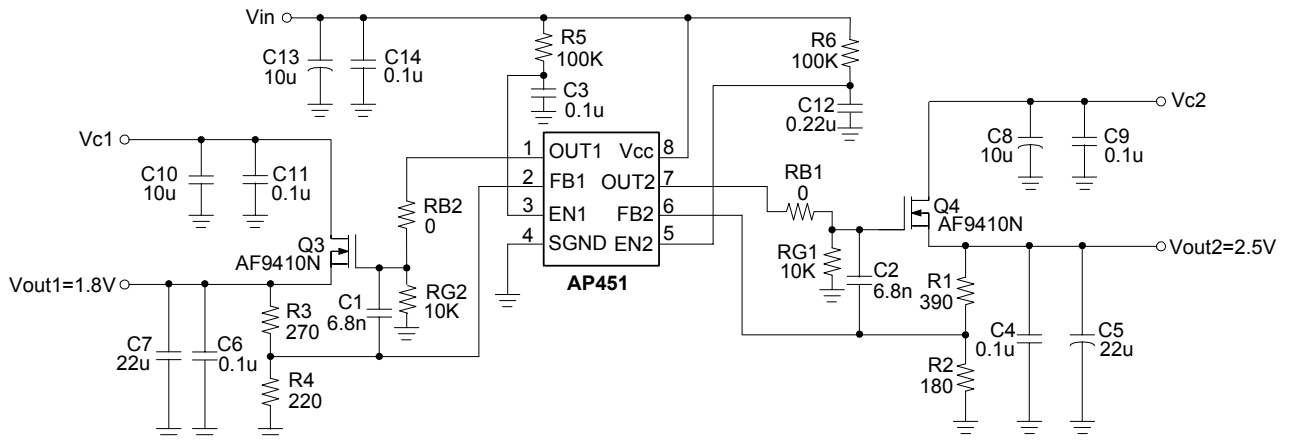
##### (2) BJT



##### (3) BJT with MLCC



##### (4) MOSFET with MLCC



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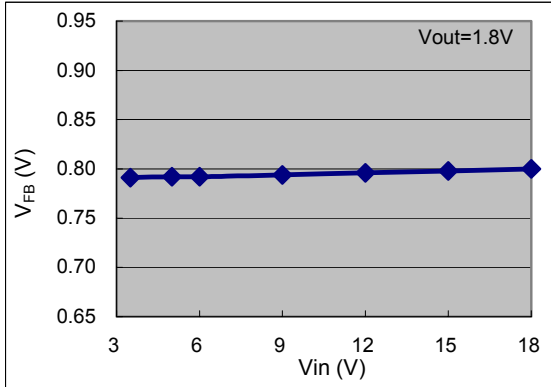


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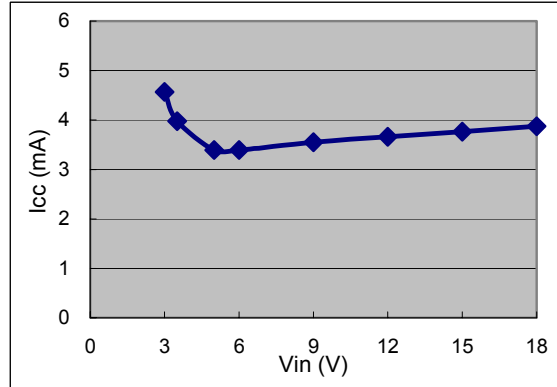
### 2 Channel Linear Controller with Independent Enable Function

#### ■ Typical Characteristics

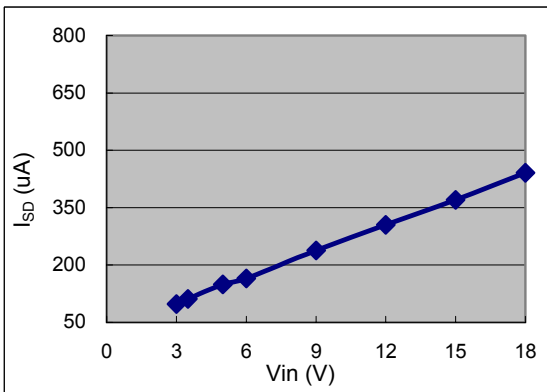
**Line Regulation**  
(BJT(882):  $V_{cc}=V_{in}$ ,  $V_{c1}$  &  $V_{c2}=3.3V$ ,  $I_{out}=0.01A$ )



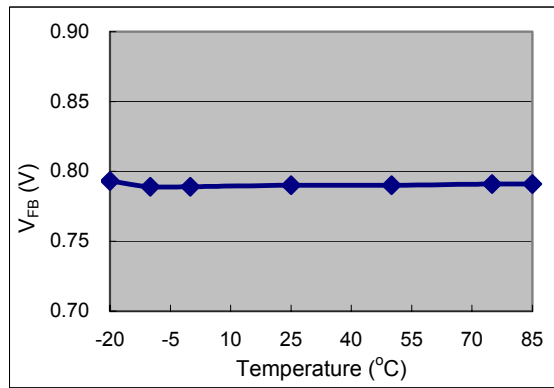
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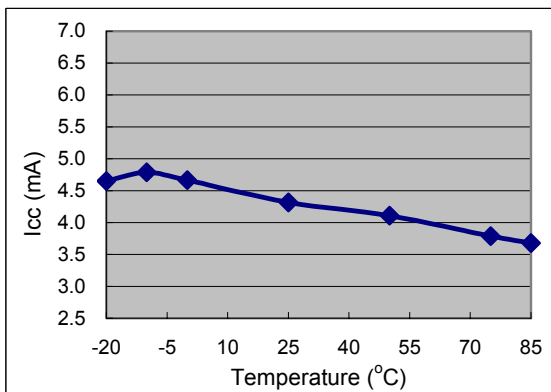
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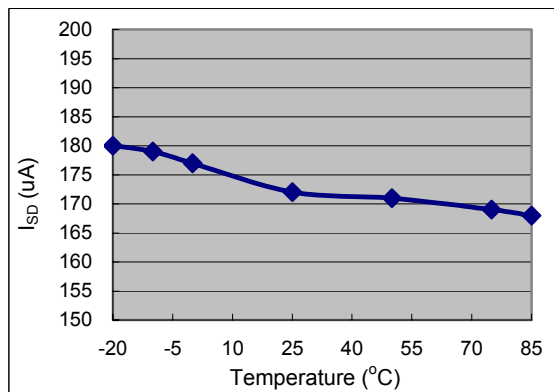
**Temperature v.s.  $V_{FB}$**   
(MOS(AF9410N):  $V_{cc}=6V$ ;  $V_{c1}$  &  $V_{c2}=3.3V$ ;  $V_{out1}=1.8V$ ,  $V_{out2}=2.5V$ ,  $I_{out1\&2}=10mA$ )



**Temperature v.s.  $I_{cc}$**   
(MOS(AF9410N):  $V_{cc}=6V$ ;  $V_{c1}$  &  $V_{c2}=3.3V$ ;  $V_{out1}=1.8V$ ,  $V_{out2}=2.5V$ ,  $I_{out1\&2}=10mA$ )



**Temperature v.s.  $I_{SD}$**   
(MOS(AF9410N):  $V_{cc}=6V$ ;  $V_{c1}$  &  $V_{c2}=3.3V$ ;  $V_{out1}=1.8V$ ,  $V_{out2}=2.5V$ ,  $I_{out1\&2}=10mA$ )



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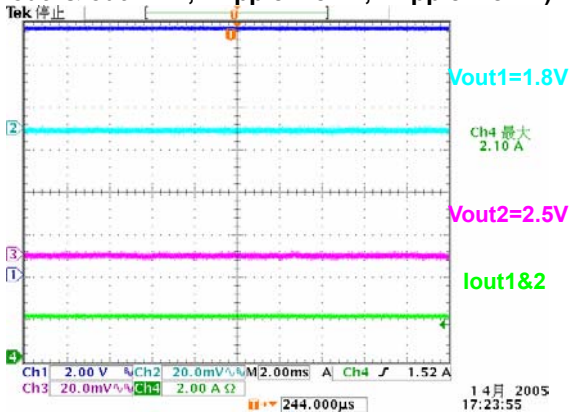


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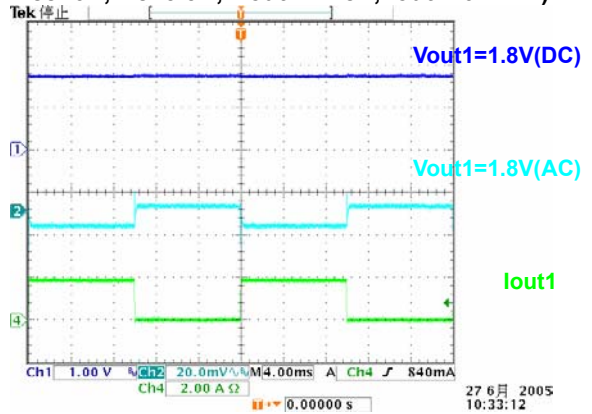
### 2 Channel Linear Controller with Independent Enable Function

#### ■ Typical Characteristics(Continued)

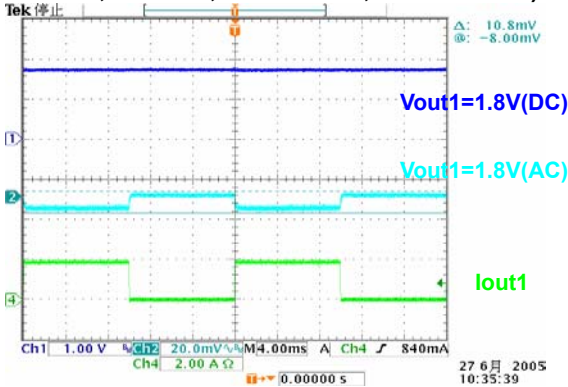
**Vout Ripple**  
(Vcc=6V; Vc1&Vc2=3.3V; Vout1=1.8V, Vout2=2.5V,  
Iout1&Iout2=1A, Vripple1=8mV, Vripple2=8mV)



**Power Transient Test**  
(Use BJT(882)+Cout=220uF(AL))  
Vcc=6V; Vc=3.3V; Vout1= 1.8V, Iout1=0A~2A)



**Power Transient Test**  
(Use MOS(AF9410N)+220uF (AL))  
Vcc=6V; Vc=3.3V; Vout1= 1.8V, Iout1=0A~2A)



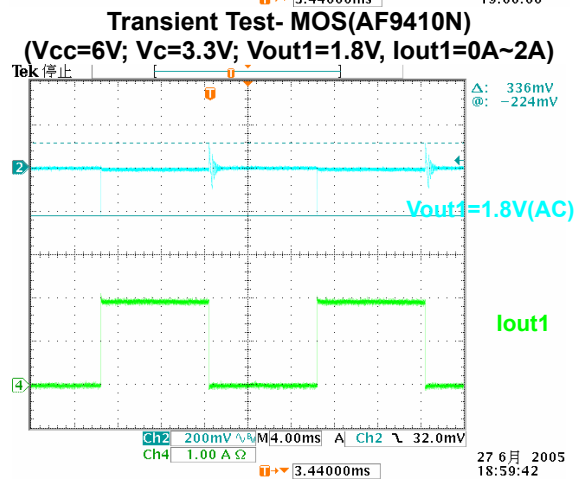
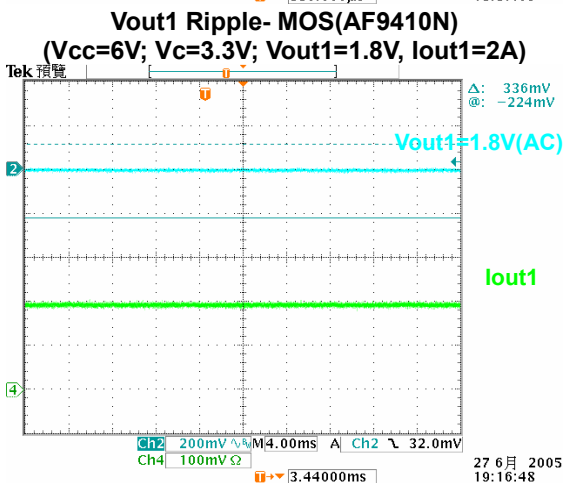
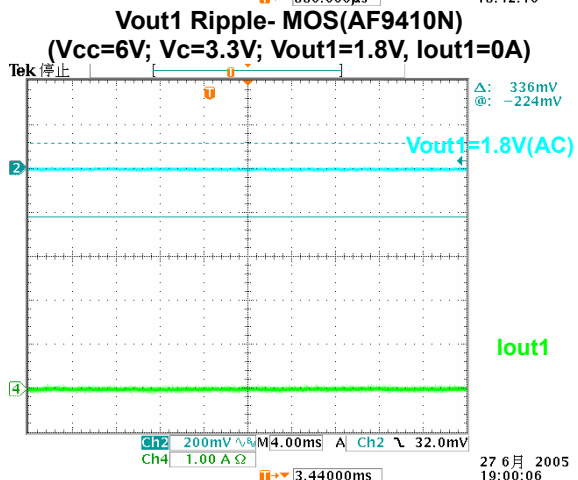
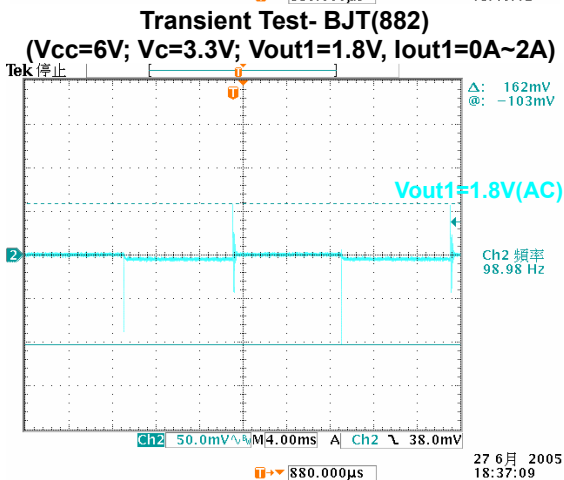
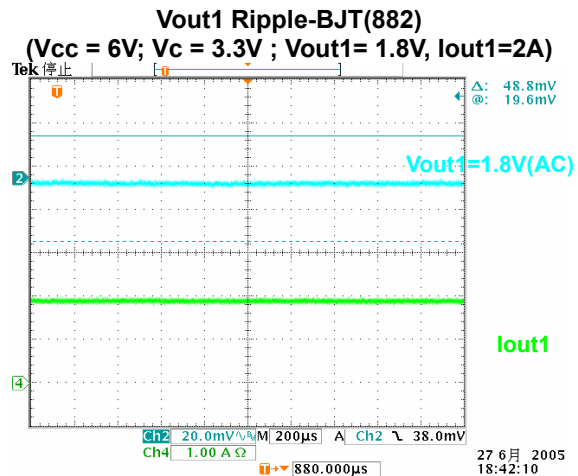
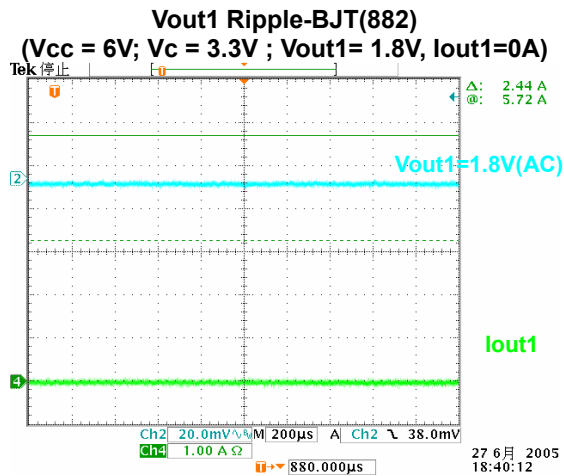
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### 2 Channel Linear Controller with Independent Enable Function

#### ■ Typical Characteristics (with MLCC)



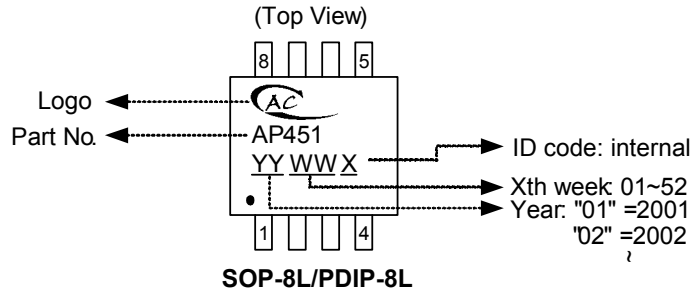
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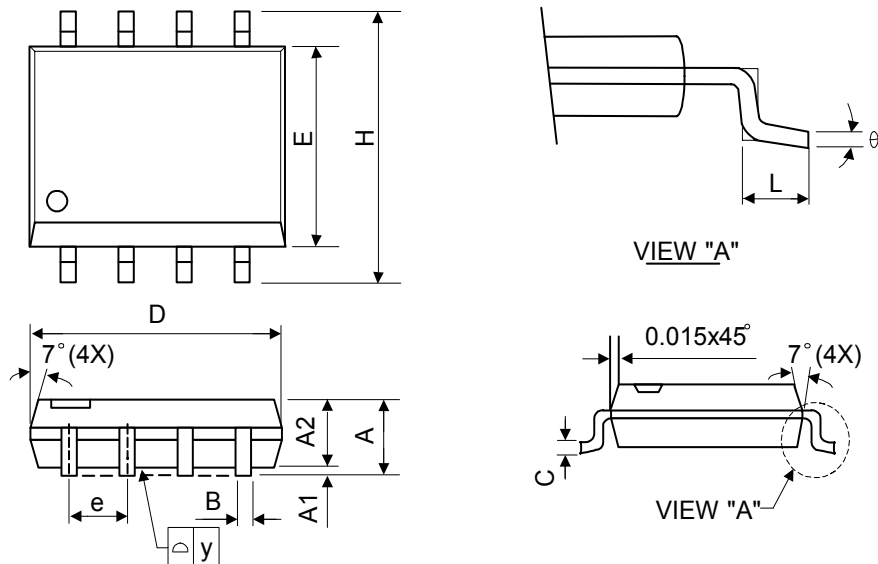
## 2 Channel Linear Controller with Independent Enable Function

### ■ Marking Information



### ■ Package Information

#### (1) SOP-8L



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
θ	0°	-	8°	0°	-	8°



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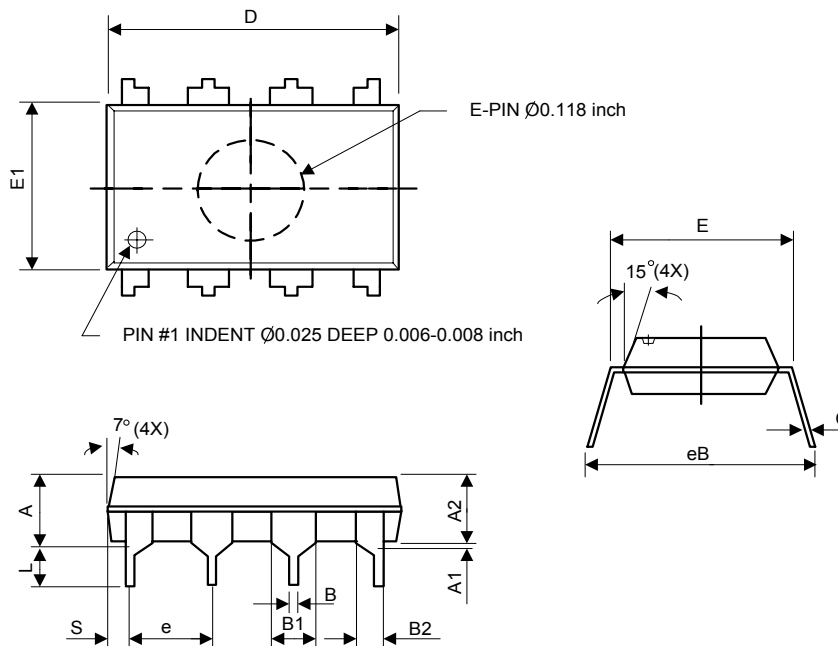


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2 Channel Linear Controller with Independent Enable Function

## Package Information (Continued)

(2) PDIP-8L



Symbol	Dimensions in millimeters			Dimensions in inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	-	-	5.33	-	-	0.210
A1	0.38	-	-	0.015	-	-
A2	3.1	3.30	3.5	0.122	0.130	0.138
B	0.36	0.46	0.56	0.014	0.018	0.022
B1	1.4	1.52	1.65	0.055	0.060	0.065
B2	0.81	0.99	1.14	0.032	0.039	0.045
C	0.20	0.25	0.36	0.008	0.010	0.014
D	9.02	9.27	9.53	0.355	0.365	0.375
E	7.62	7.94	8.26	0.300	0.313	0.325
E1	6.15	6.35	6.55	0.242	0.250	0.258
e	-	2.54	-	-	0.100	-
L	2.92	3.3	3.81	0.115	0.130	0.150
eB	8.38	8.89	9.70	0.330	0.350	0.382
S	0.71	0.84	0.97	0.028	0.033	0.038