



# AP435/435L

( Preliminary )

## Dual Linear Controller With Shutdown

### ■ Features

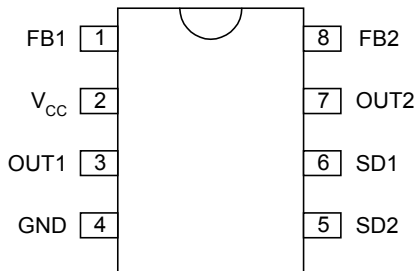
- Power shutdown (SD) control
- Fixed output voltage reference 1.25V
- Voltage precision:
  - AP435L:  $1.25 \pm 0.4\%$
  - AP435 :  $1.25 \pm 1\%$
- Wide power supply range: 3 to 32V
- Sourcing current capability: 1 to 200mA
- Typical output impedance:  $0.2\Omega$

### ■ Application

- Computer
- Disk driver
- CD-ROM
- Graphic Card
- TFT panel

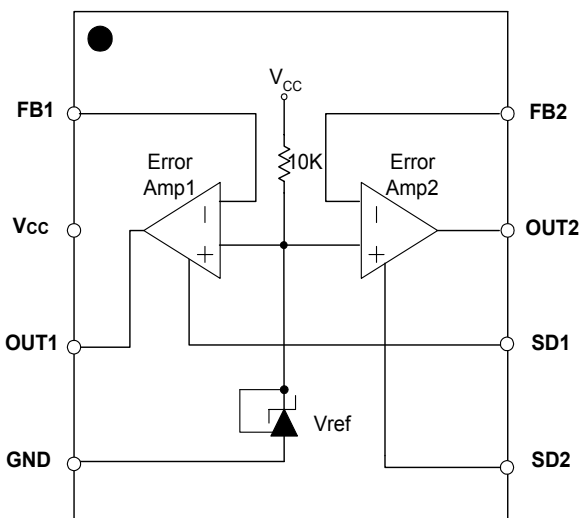
### ■ Pin Assignments

( Top view )



( DIP8/SO8 )

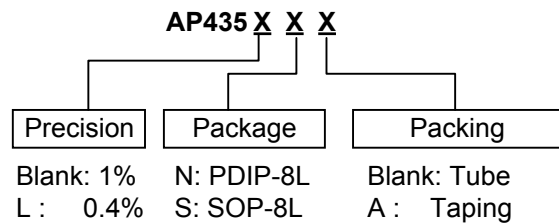
### ■ Block Diagram



### ■ General Descriptions

The AP435/435L is a linear controller IC with Shutdown function, wired to a 1.25V fixed Voltage Reference. This device is offering space and cost saving in many applications like power supply management or data acquisition systems.

### ■ Ordering Information



### ■ Pin Descriptions

Name	Descriptions
OUT1	Output1
FB1/2	Output Feedback
V <sub>CC</sub>	Supply Voltage
GND	Ground
SD1/2	Power shutdown control
OUT2	Output2



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## ■ Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit
$V_{CC}$	Supply Voltage	36	V
$V_{SD}$	Shutdown pin		V
$V_{ESD}$	ESD	2	KV
$V_{IN}$	Input Voltage	-0.3 ~ +36	V
$T_{OP}$	Operating temperature range	-55 ~ +125	°C
$T_{ST}$	Storage temperature range	-65 ~ +150	°C
$\theta_{JA}$ (DIP package)	Thermal resistance junction to Ambient	100	°C/W
$\theta_{JA}$ (SOP package)		160	
$T_J$	Maximum junction temperature	150	°C

## ■ Electrical Characteristics ( $T_{AMB}=25^{\circ}C$ , $V_{CC}=5V$ )

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$V_{CC}$	Input voltage		3		32	V
$I_{CC(ACTIVE)}$	Supply current	$V_{CC(+)}=5V$ , No Load $T_{MIN}<T_{AMB}<T_{MAX}$		0.7	1.2	mA
$I_{CC(SHUTDOWN)}$						

## Error-amp ( $V_{CC} = 5V$ , $T_{AMB}=25^{\circ}C$ , unless otherwise notice )

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit	
$V_{IO}$	Input Offset voltage $V_{icm} = 0V$	AP435	$T_{AMB}=25^{\circ}C$		1	4	mV
			$T_{MIN}<T_{AMB}<T_{MAX}$			5	
		AP435L	$T_{AMB}=25^{\circ}C$		0.5	2	
			$T_{MIN}<T_{AMB}<T_{MAX}$		0.5	3	
$DV_{IO}$	Input Offset voltage Drift			7		$\mu V / ^{\circ}C$	
$SVRR$	Supply voltage rejection ratio	$V_{CC}^{+}=5\sim 30V$	65	100		dB	
$I_{SOURCE}$	Output current source	$V_{CC}=+15V, V_O=2V, V_{ID}=+1V$	20	40		mA	
$I_{SHORT}$	Short circuit to Ground	$V_{CC}=+15V$		40	60	mA	
$I_{SINK}$	Output current Sink	$V_{CC}=+15V, V_O=2V, V_{ID}=-1V$	10	20		mA	
$I_{IR}$	Input bias current	Negative input		20		nA	
$V_{OH}$	High Level output voltage	$T_{AMB}=25^{\circ}C, R_L=10K$ $V_{CC}^{+}=30V, T_{MIN}<T_{AMB}<T_{MAX}$	27	28		V	
$V_{OL}$	Low Level output voltage	$R_L=10K$ $T_{MIN}<T_{AMB}<T_{MAX}$		5	20	mV	
$A_{VD}$	Large signal voltage gain	$V_{CC}=+15V, V_O=1.4\sim 11.4V,$ $R_L=2K, T_{MIN}<T_{AMB}<T_{MAX}$		100		V/mV	
SR	Slew rate at unity gain	$V_I=0.5\sim 3V, V_{CC}=15V, R_L=2K,$ $C_L=100pF$ , unity gain	0.3	0.5		$V / \mu s$	
GBP	Gain bandwidth product	$V_{CC}=30V, R_L=2K, C_L=100pF$ $f = 100KHz, V_{IN}=10mV$	0.5	0.9		MHz	
THD	Total Harmonic Distortion	$V_{CC}=30V, R_L=2K, C_L=100pF$ $f = 1KHz, V_O=2V_{P-P}, A_V=20dB$		0.02		%	

### Voltage reference

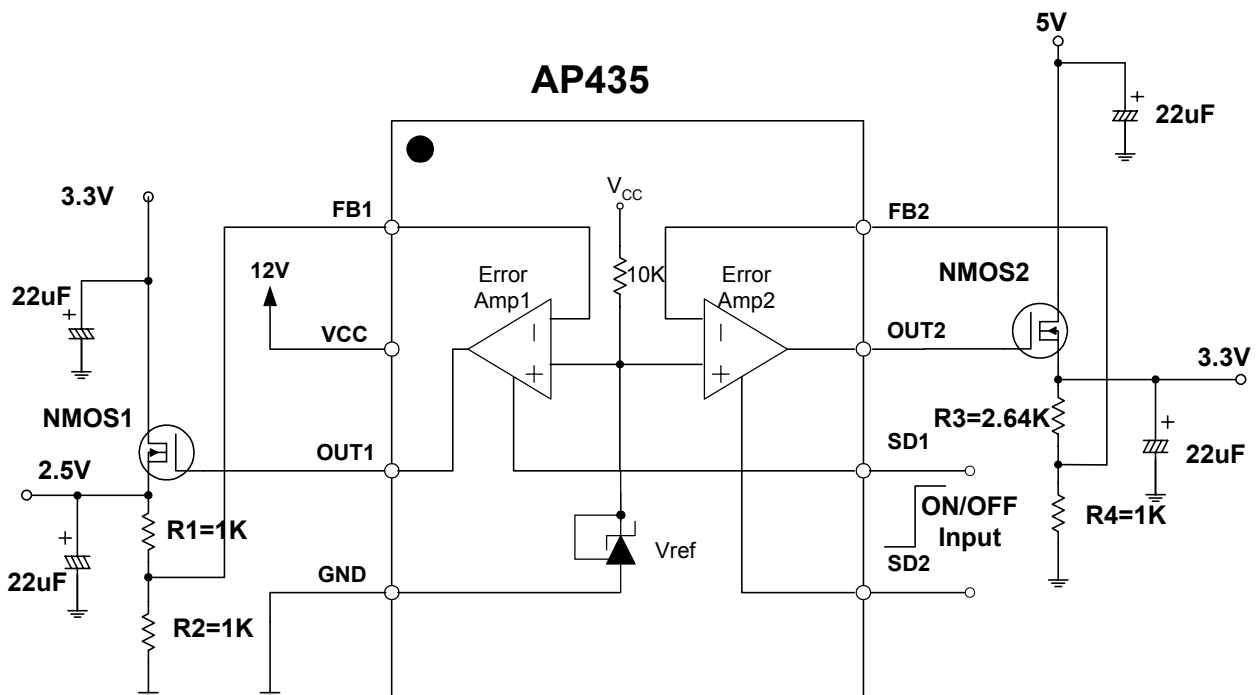
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit	
$V_{REF}$	Reference input voltage	AP435	$T_{AMB}=25^{\circ}C$	1.237	1.25	1.263	V
			$T_{MIN}<T_{AMB}<T_{MAX}$	1.225		1.275	
		AP435L	$T_{AMB}=25^{\circ}C$	1.245		1.255	
			$T_{MIN}<T_{AMB}<T_{MAX}$	1.237		1.263	
$\Delta V_{REF}$	Reference input voltage deviation over Temperature range	$V_{KA}=V_{REF}, I_K=10mA$ $T_{MIN}<T_{AMB}<T_{MAX}$		3.0	20	mV	
$I_{MIN}$	Minimum cathode current for regulation	$V_{KA}=V_{REF}$		0.15	0.3	mA	
$I_K$	Cathode Current			0.2	1	mA	
$ Z_{KA} $	Dynamic impedance (note1)	$V_{KA}=V_{REF}$ $\Delta I_K=1\sim 100mA, f=0$		0.2	0.5	$\Omega$	

Note 1 : The dynamic impedance is defined as  $|Z_{KA}| = \Delta V_{KA} / \Delta I_K$

### Shutdown control

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$V_{SDL}$	Threshold voltage	Active mode			0.2	V
$V_{SDH}$		Shutdown mode	0.8			V
$I_{SD}$	Current in shutdown mode					$\mu A$

### ■ Typical Application Circuit





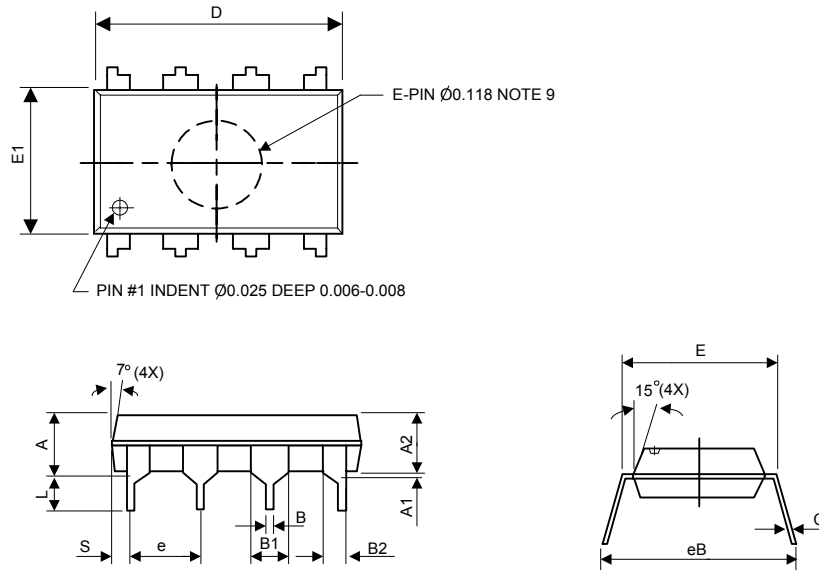
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## ■ Package Outline

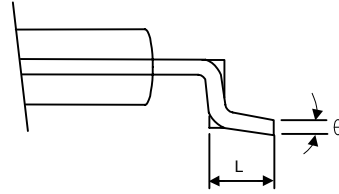
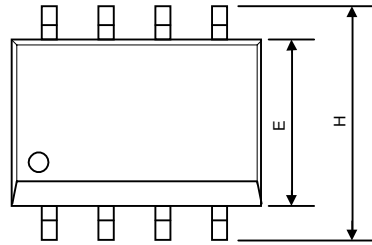
### (1) Plastic Dual-in-line Package:PDIP-8L



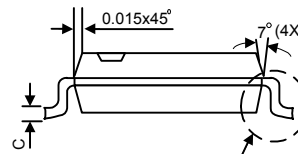
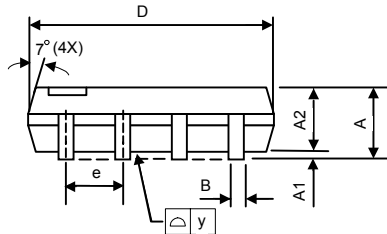
Symbols	Dimensions in millimeters			Dimensions in inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	–	–	5.33	–	–	0.210
A1	0.38	–	–	0.015	–	–
A2	3.1	3.30	3.5	0.122	0.130	0.138
B	0.36	0.46	0.56	0.014	0.018	0.022
B1	1.4	1.52	1.65	0.055	0.060	0.065
B2	0.81	0.99	1.14	0.032	0.039	0.045
C	0.20	0.25	0.36	0.008	0.010	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	9.40	0.330	0.350	0.370
S	0.71	0.84	0.97	0.028	0.033	0.038

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### (2) JEDEC Small Outline Package :SOP-8L



VIEW "A"



VIEW "A"

Symbols	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	4.85	5.05	0.189	0.191	0.199
E	3.80	3.91	4.00	0.150	0.154	0.157
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°