SP435W
Dual OP AMP with Voltage Regulator

DESCRIPTION

The **SP435W** is a monolithic IC specifically designed to control the output current and voltage levels of switch mode battery chargers and power supplies.
The device contains two operational amplifiers and a precision shunt regulator. Op Amp 1 is designed for voltage control, whose non-inverting input internally connects to the output of the shunt regulator. Op Amp 2 is for current control with both inputs uncommitted. The IC offers the power converter designer a control solution that features increased precision with a corresponding reduction in system complexity and cost.

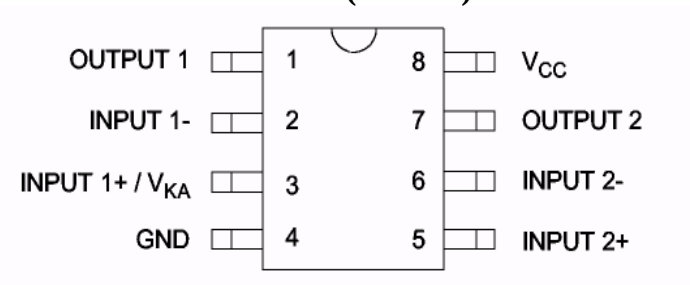
APPLICATIONS

- Battery Power Equipment
- Linear Regulators
- Switch Power Supply
- Cellular Phone
- Digital Cameras
- Computer Disk Drivers
- Instrumentation

FEATURES

- Input offset voltage: 0.5mV
- Supply current: 75 uA per Op Amp at 5.0V supply voltage
- Unity gain bandwidth: 1MHz
- Output voltage swing: 0 to (VCC- 1.5) V
- Power supply range: 3 to 36V
- Fixed output voltage reference: 2.5V
- Sink current capability from 0.05 to 80mA
- Typical Output Impedance : 0.2Ω
- SOP-8 Package

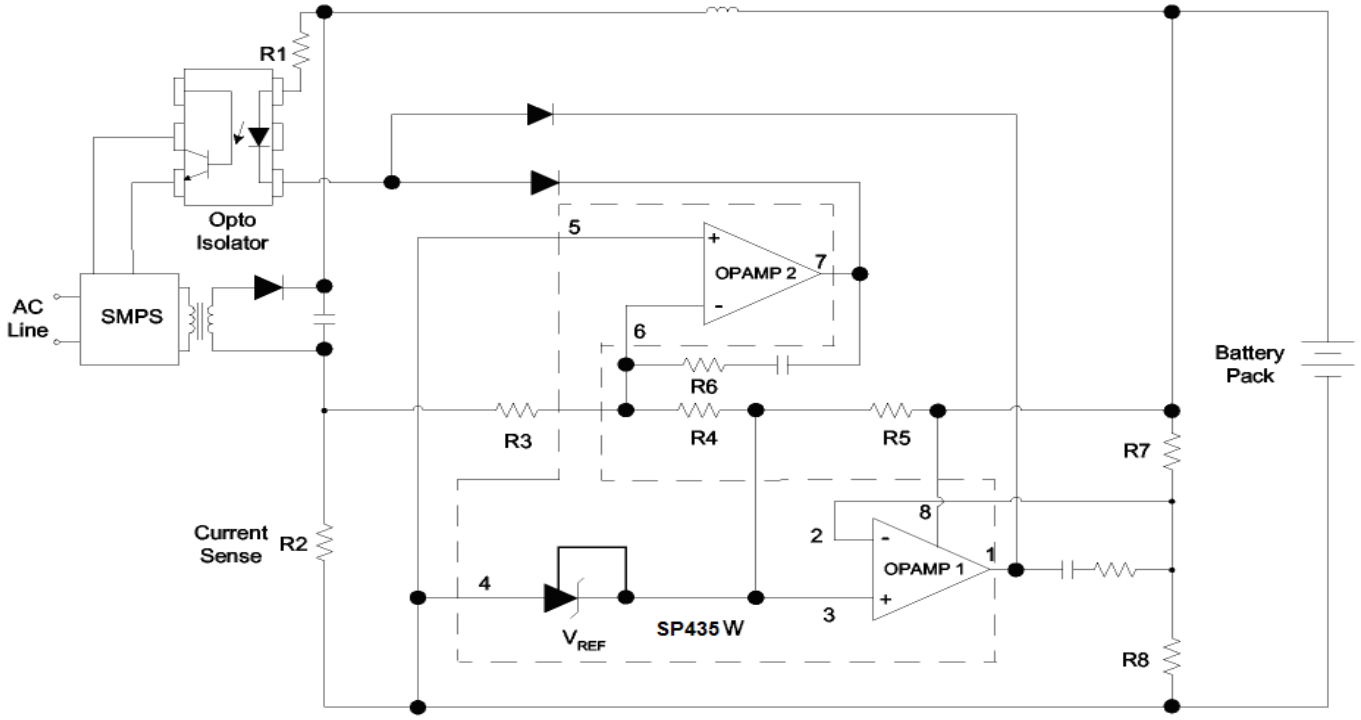
PIN CONFIGURATION (SOP-8)



PART MARKING

A : Lot Code
B : Data Code

TYPICAL APPLCATION CIRCUIT



PIN DESCRIPTION

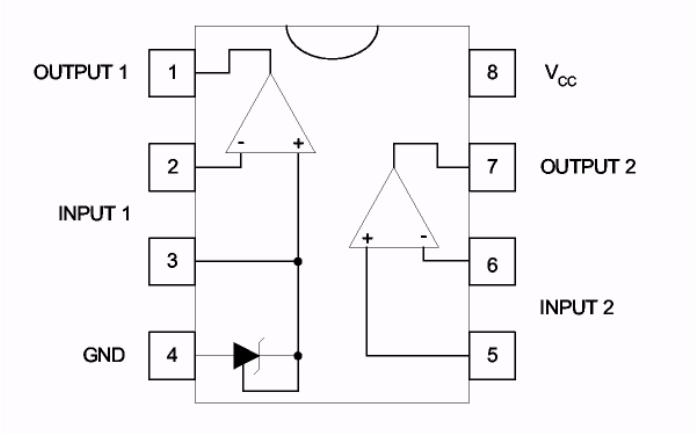
Pin	Symbol	Description
1	Output 1	OP Amp Output 1
2	Input 1-	OP Amp Input 1 Voltage
3	Input 1+ VKA	Power Switching Output
4	GND	Ground
5	Input 2+	OP Amp Input 2 Voltage
6	Input 2-	OP Amp Input 2 Voltage
7	Output 2	OP Amp Output 2
8	Vcc	Power Supply Voltage

ORDERING INFORMATION

Part Number	Voltage tolerance	Package	Part Marking
SP435WS8RGB	±1%	SOP-8	SP435W

※ **SP435W**S8RGB : 13” Tape Reel; Pb – Free, Halogen-Free

BLOCK DIAGRAM



ABSOULTE MAXIMUM RATINGS (TA=25℃, unless otherwise specified.)

The following ratings designate persistent limits beyond which damage to the device may occur.

Symbol	Parameter	Value	Unit
V_{CC}	DC Supply Voltage (Vcc to Ground)	40	V
V_{IN}	OP Amp 1 and 2 Input Voltage (Pin 2, 5, 6)	-0.3~Vcc+0.3	V
V_{ID}	OP Amp 2 Input Differential Voltage (Pin 5, 6)	40	V
I_K	Voltage Reference Cathode Current (Pin 3)	100	mA
T_{STG}	Storage Temperature Range	-65 to 150	℃
T_{LEAD}	Lead Soldering Temperature for 5 sec.	260	℃
Tope	Operation Temperature Range	-40 ~ 105	℃
P_D	Power Dissipation	500	mW

ELECTRICAL CHARACTERISTICS

(Unless otherwise stated, these specifications apply T_A=25℃; V_{CC}=+5V)

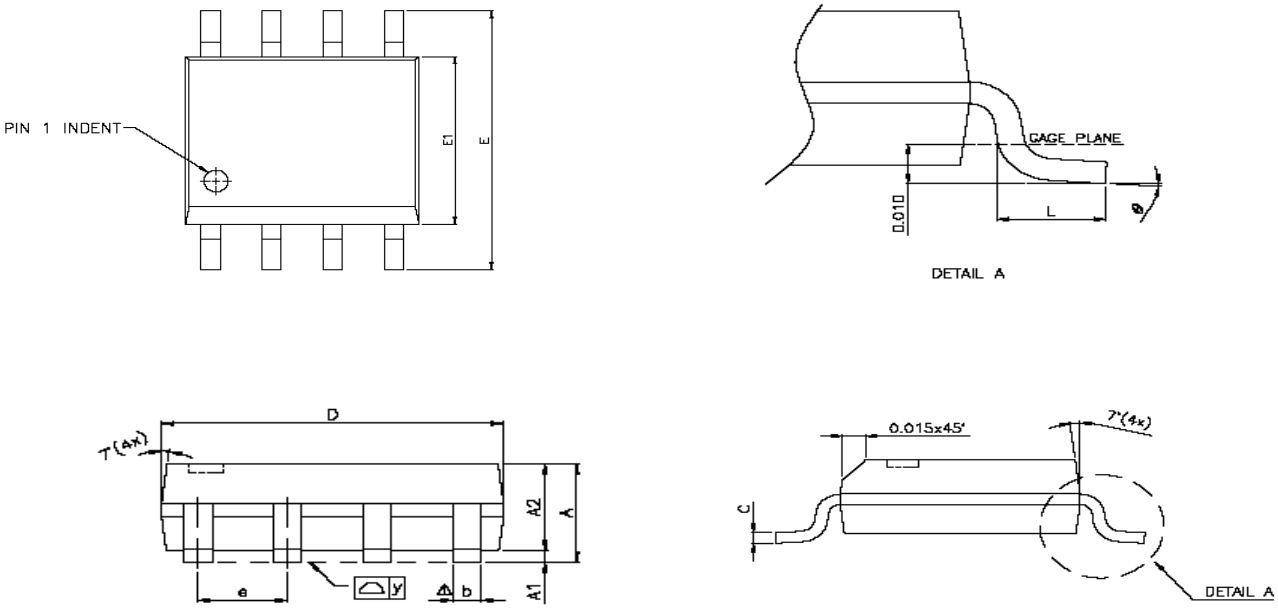
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
SUPPLY						
V_{CC}	Supply Voltage		3		36	V
I_{CC}	Supply Current, excluding Current in Voltage Reference	V_{CC} = 5V, no load		0.15	0.25	mA
		V_{CC} = 30V, no Load		0.2	0.3	
VOLTAGE REFERENCE SECTION						
V_{REF}	Reference Voltage:SP435WS8RGB	I_{KA} =10 mA, Ta = 25℃	2.475	2.5	2.525	V
ΔV_{REF}	Reference Voltage Deviation over Temp Range	I_{KA} =10 mA, T_A = -40~85℃		5	24	mV
I_{MIN}	Minimum Cathode Current for Regulation	V_{KA} = V_{REF}		0.01	0.05	mA
$\lvert Z_{KA} \rvert$	Dynamic Impedance	V_{KA} = V_{REF}, I_{KA} = 1mA~80mA, f<1KHz		0.2	0.5	Ω
OP AMP 1 SECTION (V_{CC+} = 5V, V_O = 1.4V)						
V_{IO}	Input Offset Voltage	T_A = 25℃		0.5	3.0	mV
		T_A = -40℃~85℃			5.0	
αV_{IO}	Input Offset Voltage Temperature Drift	T_A = -40℃~85℃		7		μV/℃
I_{IB}	Input Bias Current (Inverting Input Only)			20	150	nA
A_{VD}	Large Signal Voltage Gain	V_{CC} = 15V, R_L = 2KΩ, V_O = 1.4~11.4V	85	100		V/mV
K_{SVR}	Power Supply Rejection Ratio	V_{CC+} = 5~30V	70	90		dB
$I_{O(SINK)}$	Output Sink Current	V_{CC} = 15V, V_{ID} = -1V, V_O = 2V	7	20		mA
$I_{O(SOURCE)}$	Output Source Current	V_{CC} = 15V, V_{ID} = 1V, V_O = 2V	20	40		mA
V_{OH}	Output Voltage Swing High	V_{CC} = 30V, V_{ID} = 1V, R_L = 10KΩ	27	28		V
V_{OL}	Output Voltage Swing Low	V_{CC} = 30V, V_{ID} = -1V, R_L = 10KΩ		17	100	mV
SR	Slew Rate	V_{CC} = 18V, R_L = 2KΩ, V_I = 0.5~2V, C_L= 100 pF	0.2	0.5		V/μS
GBW	Gain Bandwidth Product	V_{CC} = 30V, R_L = 2KΩ, C_L = 100 pF	0.7	1		MHz

ELECTRICAL CHARACTERISTICS

(Unless otherwise stated, these specifications apply TA=25℃; VCC=+5V)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
OP AMP 2 SECTION (V_{CC+} = 5V, V_O = 1.4V)						
V_{IO}	Input Offset Voltage	T_A = 25℃		0.5	3.0	mV
		T_A = -40℃~85℃			5.0	
αV_{IO}	Input Offset Voltage Temperature Drift	T_A = -40℃~85℃		7		μV/℃
I_{IO}	Input Offset Current			2	30	nA
I_{IB}	Input Bias Current (Inverting Input Only)			20	150	nA
V_{ICR}	Input Common Mode Voltage Range	Vcc = 0 to 36V	0		Vcc – 1.5	V
CMRR	Common Mode Rejection Ratio	T_A = 25℃, V_{CM} = 0~3.5V	70	85		dB
A_{VD}	Large Signal Voltage Gain	V_{CC} = 15V, R_L = 2KΩ, V_O = 1.4~11.4V	85	100		V/mV
K_{SVR}	Power Supply Rejection Ratio	V_{CC+} = 5~30V	70	90		dB
$I_{O(SINK)}$	Output Sink Current	V_{CC} = 15V, V_{ID} = -1V, V_O = 2V	7	20		mA
$I_{O(SOURCE)}$	Output Source Current	V_{CC} = 15V, V_{ID} = 1V, V_O = 2V	20	40		mA
V_{OH}	Output Voltage Swing High	V_{CC} = 30V, V_{ID} = 1V, R_L = 10KΩ	27	28		V
V_{OL}	Output Voltage Swing Low	V_{CC} = 30V, V_{ID} = -1V, R_L = 10KΩ		17	100	mV
SR	Slew Rate	V_{CC} = 18V, R_L = 2KΩ, V_I = 0.5~2V, C_L= 100 pF	0.2	0.5		V/μS
GBW	Gain Bandwidth Product	V_{CC} = 30V, R_L = 2KΩ, C_L = 100 pF,	0.7	1		MHz

SOP- 8 PACKAGE OUTLINE



SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.47	1.60	1.73	0.058	0.063	0.068
A1	0.10	——	0.25	0.004	——	0.010
A2	——	1.45	——	——	0.057	——
b	0.33	0.41	0.51	0.013	0.016	0.020
C	0.19	0.20	0.25	0.0075	0.008	0.0098
D	4.80	4.85	4.95	0.189	0.191	0.195
E	5.80	6.00	6.20	0.228	0.236	0.244
E1	3.80	3.90	4.00	0.150	0.154	0.157
e	——	1.27	——	——	0.050	——
L	0.38	0.71	1.27	0.015	0.028	0.050
② y	——	——	0.076	——	——	0.003
θ	0°	——	8°	0°	——	8°

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