SP6872A
Multi-Mode PWM Controller

DESCRIPTION

SP6872A is a high performance flyback multi-mode PWM controller, optimized to achieve high efficiency and low standby power with effective system cost.

At full load IC operates in CCM mode with fixed frequency at low line input range and in QR mode at high line input range. At normal load conditions it operates in QR mode with internally limited frequency to 90kHz typ. to minimize switching loss. Controller gradually reduces frequency with loading at light load conditions to keep high efficiency and switches to extended burst mode at no-load conditions to minimize stand-by power loss. As a result, high conversion efficiency can be achieved with universal input range and within whole loading range.

The rich set of protection features such as VCC Under Voltage Lockout (UVLO), VCC Over Voltage Protection (VCC OVP) and clamp, load Over Voltage Protection (OVP), Over Load Protection (OLP) and on-chip Over Temperature Protection (OTP), the programmable Brown-in/out Protection is built-in.helps to build low component counts and high performance power supply.

The tone energy at below 23KHz is minimized in the design and audio noise is eliminated during operation.

SP6872A is offered in space saving SOT23-6 package.

FEATURES

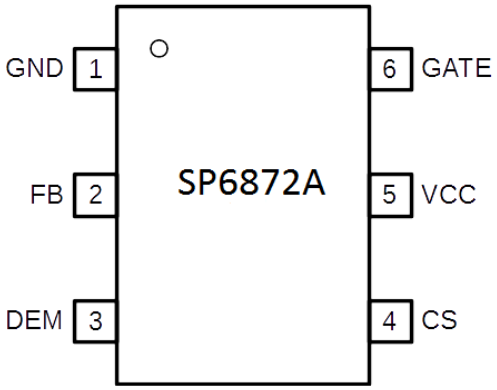
- Internal soft start reducing MOSFET VDS stress
- Multi-mode operation for better efficiency
- Frequency shuffling for better EMI
- Extended burst mode for lower standby power loss
- The rich set of protection features:
  - VCC Under Voltage Lockout (UVLO) with hysteresis
  - VCC Over Voltage Protection (VCC OVP) and clamp
  - Cycle-by-cycle current limiting with line voltage compensation
  - Over Load Protection (OLP) with auto-recovery
  - Adjustable brown-out protection with auto-recovery
  - Adjustable load Over Voltage Protection (OVP) with latch.
  - Fixed on-chip and adjustable external over temperature protection (OTP) with auto-recovery

APPLICATIONS

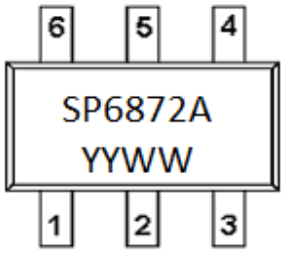
- AC/DC switching power adaptor
- Set-top box power supply
- Open-frame switching power supply
- NB Adaptor
- TV/Monitor Standby Power
- PC Peripherals

PIN CONFIGURATION (SOT-23-6L)

SOT23-6

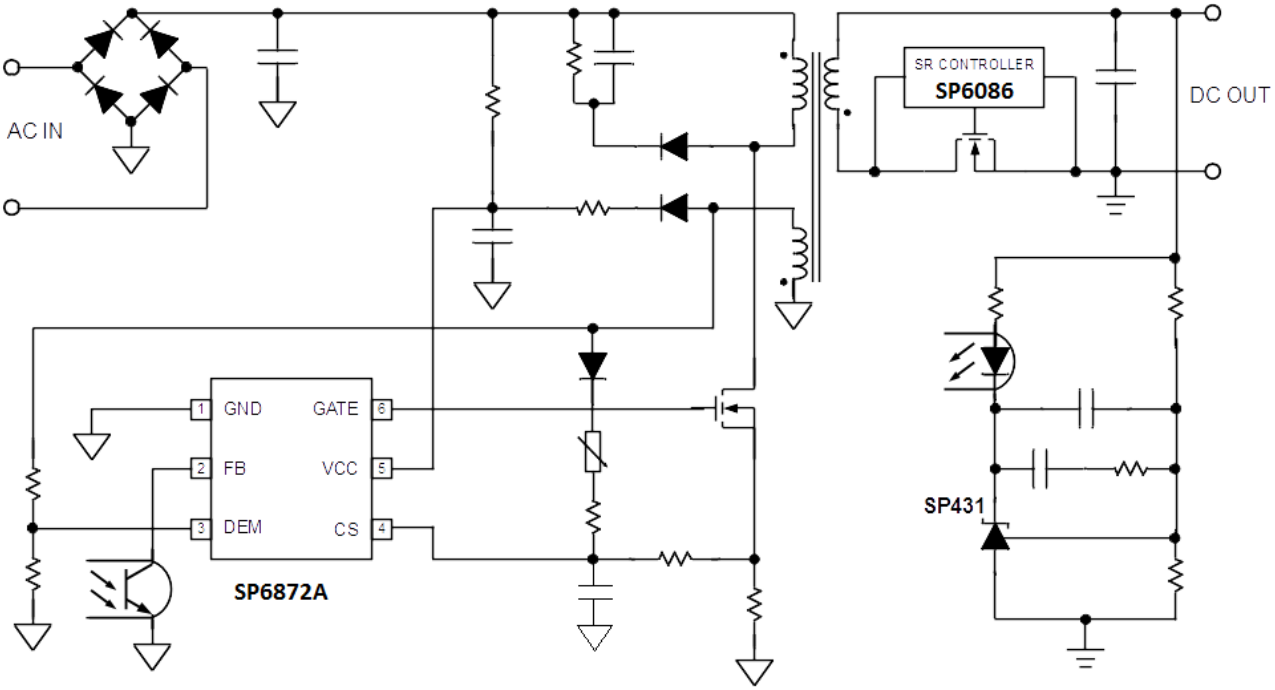


PART MARKING



Y : Year Code
W : Week Code

TYPICAL APPLICATION CIRCUIT



PIN DESCRIPTION

Pin No.	Pin Name	Description
1	GND	Ground pin
2	FB	Feedback pin. The PWM duty cycle is determined by voltage level on this pin and the current sense signal at pin 4
3	DEM	Multiple function pin. Transformer demagnetization, load OVP and brown-in/brown-out detection pin
4	CS	Current sense pin. Also can be used for external over temperature protection with connected to an auxiliary winding of the PWM transformer a NTC resistor and a diode
5	VCC	IC power supply pin
6	GATE	Gate driver output pin

PROTECTION MODE

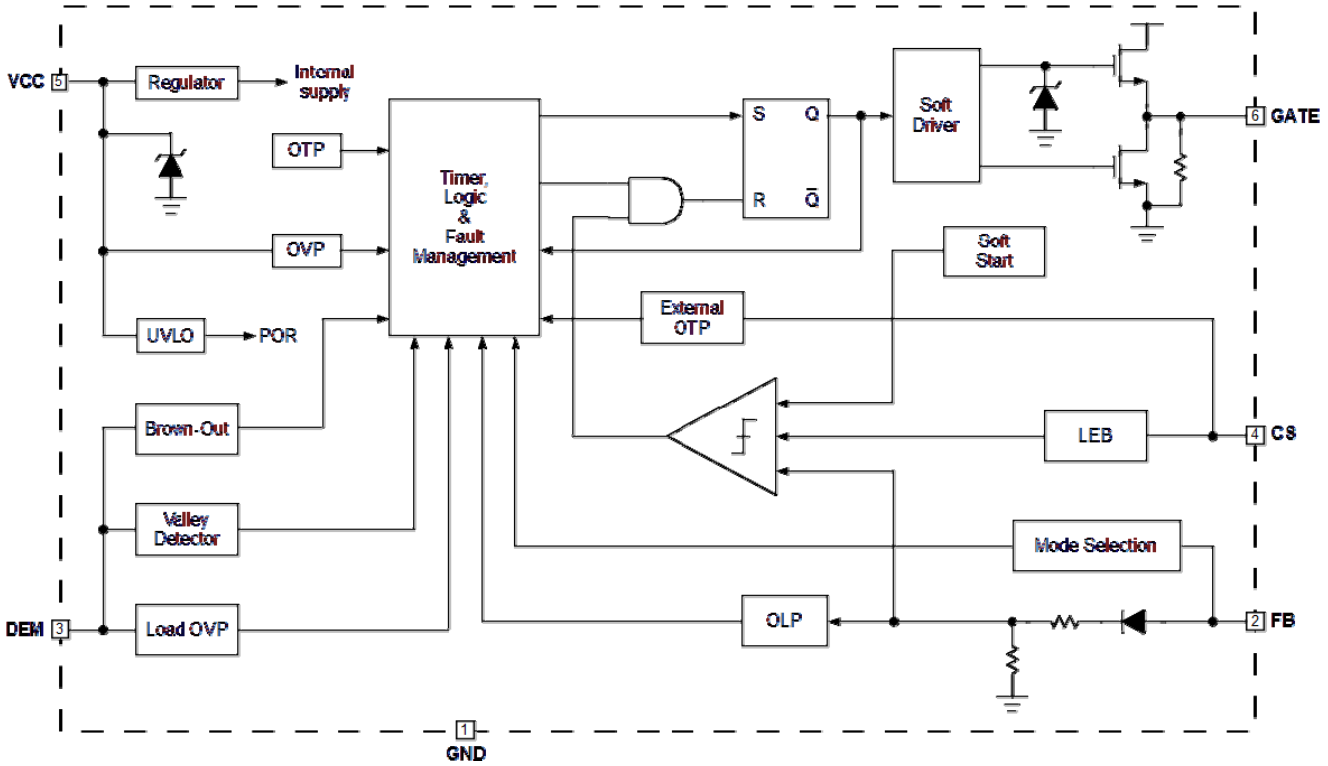
Part number	VCC_OVP	OSCP	DEM_OVP	OLP	OTP	BNI/BNO
SP6872A	Latch	Auto Recovery	Latch	Auto Recovery	Auto Recovery	Auto Recovery

ORDERING INFORMATION

Part Number	Package	Part Marking
SP6872AS26RGB	SOT-23-6L	SP6872A

※ SP6872AS26RGB : Tape Reel ; Pb – Free ; Halogen – Free

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS (T_A=25°C, unless otherwise specified)

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

Symbol	Parameter	Value	Unit
V_{CC}	Zener clamp voltage (@ 10mA)	31	V
V_{FB}, V_{CS}, V_{DEM}	FB, CS, DEM pin voltage	-0.3 ~ 7.0	V
T_{OP}	Operating ambient temperature	-40 ~ 85	°C
T_J	Operating junction temperature	-40 ~ 150	°C
T_{STG}	Storage temperature	-40 ~ 150	°C
T_{LEAD}	Lead soldering temperature for 5 sec	260	°C
Thermal Resistance			
Symbol	**Parameter**	**Value**	**Unit**
$R_{\theta JA}$	Thermal Resistance Junction –to Ambient (*1)	220	°C/W
$R_{\theta JC}$	Thermal Resistance Junction –to Case (*2)	110	°C/W

(*1) θJA is measured in natural convection (still air) at TA = 25°C with the component mounted on a low effective thermal conductivity test board of JEDEC 51-3 thermal measurement standard.

(*2) The power dissipation and thermal resistance are evaluated under copper board mounted with free air conditions.

ELECTRICAL CHARACTERISTICS

(T_A=25°C, V_{CC}=16V, unless otherwise specified)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Supply Voltage Section (VCC pin)						
Istup	Start-up current	V_{CC}=UVLO(OFF)-1.5V		5	15	uA
Icc(op)	Operating current	V_{FB}=3V		2	3	mA
		V_{FB}=3V, C_L=1nF		3	4.5	mA
Icc(burst)	Burst mode operating current	V_{FB}=0.5V, V_{CS}=0V		0.6	0.8	mA
UVLO(ON)	VCC under voltage lockout enter		7	8	10	V
UVLO(OFF)	VCC under voltage lockout exit (Recovery)		17	18.5	21	V
OVP	VCC over voltage protection			28		V
Vcc_clamp	Clamping voltage	I_{CC}=10mA		31		V
Feedback Section (FB pin)						
$I_{FB(SC)}$	Short circuit current			250	400	uA
V_{FB}_Open	Open loop voltage		4.5	5.3	6.0	V
$V_{TH\_BM\_off}$	Burst mode exit threshold		0.65	0.8	0.95	V
$V_{TH\_BM\_on}$	Burst mode enter threshold		0.55	0.7	0.85	V
$V_{FB(OLP)}$	Over load protection threshold			4.4		V
$T_{DEL(OLP)}$	Over load protection delay			80		ms
Demagnetization Detection Section (DEM pin)						
$V_{DEM(TH)}$	Demagnetization threshold			75		mV
$V_{DEM(H)}$	Upper clamp voltage			6	6.5	V
$V_{DEM(L)}$	Lower clamp voltage		-0.1	-0.7		V
$T_{DEL(DEM)}$	Demagnetization propagation delay			250		ns
$V_{DEM(OVP)}$	Load over voltage protection threshold		3.2	3.75	4.3	V
$T_{DEL(OVP)}$	Number of subsequent cycles to trigger OVP			4		Cycle
$I_{B(in)}$	Brown-in current threshold		90	140	170	uA
$I_{B(out)}$	Brown-out current threshold		50	110	160	uA
$T_{B(in)}$	Number of cycles to detect brown-in			4		Cycle
$T_{B(out)}$	Brown-out De-bounce time		20	40	60	ms
Current Sense Section (CS pin)						
$V_{CS(L)}$	CS threshold at zero duty cycle	V_{FB}=3V	0.415	0.45	0.485	V
$V_{CS(H)}$	CS threshold at max duty cycle	V_{FB}=3V		0.8		V
$V_{CS(BM)}$	CS threshold at burst mode	V_{FB}=1V	0.21	0.3	0.39	V
T_{LEB}	Leading edge blanking time			300		ns
$T_{DEL(CS)}$	Over current detection and control delay			80		ns
$V_{TH(OTP)}$	External OTP threshold			0.25		V
$T_{DEL(OTP)}$	External OTP De-bounce time			50		ms

ELECTRICAL CHARACTERISTICS (*continued*)
(T_A=25°C, V_{CC}=16V, unless otherwise specified)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Soft Start Section						
T_{SS}	Soft start time			4		ms
Internal OTP						
T_{SD}	Thermal shutdown threshold			150		°C
T_{SD_HYS}	Thermal shutdown hysteresis			30		°C
Oscillator						
F_{BURST}	Burst mode switching frequency			20	25	KHz
$F_{QR(L)}$	Frequency low clamp in QR mode		60	65	70	KHz
$F_{QR(H)}$	Frequency high clamp in QR mode			90		KHz
G_PFM	Frequency reduction ratio			60		KHz/V
$\Delta F_{(shuffle)}/F$	Frequency shuffling range		-4		+4	%
T_{ON}	Maximum ON time		8	10.5	13	us
T_{OFF}	Maximum OFF time		35	50	65	us
Gate Driver Section (GATE pin)						
$V_{O(L)}$	Output low voltage	I_O=10mA			1	V
$V_{O(H)}$	Output high voltage		11.5			V
$V_{O(CLAMP)}$	Output clamp voltage	V_{CC}=20V		16.5		V
tr	Voltage rise time	C_L=1nF		100		ns
tf	Voltage fall time	C_L=1nF		50		ns

SYNC Power Corporation
7F-2, No.3-1, Park Street
NanKang District (NKSP), Taipei, Taiwan, 115,
R.O.C Phone: 886-2-2655-8178
Fax: 886-2-2655-8468
http://www.syncpower.com