



SP6878

Quasi-Resonant PWM Controller

DESCRIPTION

The SP6878 is a low cost, quasi-resonant flyback controller where the maximum frequency is below 100KHz. The internal valley detector ensures the converter operates at quasi-resonant operation over wide range of line voltage. To reduce the standby power loss and increase the efficiency at light load, a proprietary burst mode design is applied. It would provide the users a superior AC/DC power application of higher efficiency, low external component counts, and lower cost solution for applications.

The SP6878 features more protections or functions for the following characteristics: over voltage protection (OVP); over temperature protection (OTP); over load protection (OLP).

SP6878 is available by SOP-8/ DIP-8P packages.

APPLICATIONS

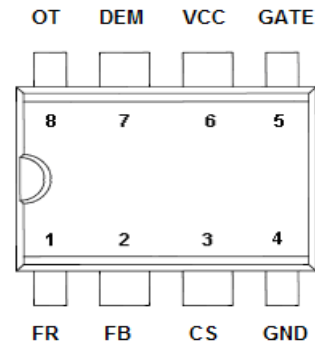
- AC/DC Switching Power Adaptor
- Set-top Box Power Supply
- Open-Frame Switching Power Supply

FEATURES

- High-Voltage BCD Process
- Under Voltage Lockout (UVLO)
- Quasi-Resonant Control
- Internal 4ms Soft Start
- Over Temperature Latch Shutdown
- OLP (Over Load Protection)
- OVP (Over Voltage Protection) on Vcc Pin
- 100KHz Maximum Frequency
- 800mA Driving Capability

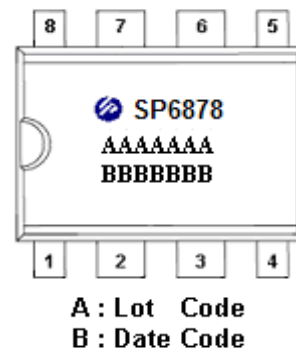
PIN CONFIGURATION

SOP-8/DIP-8



PART MARKING

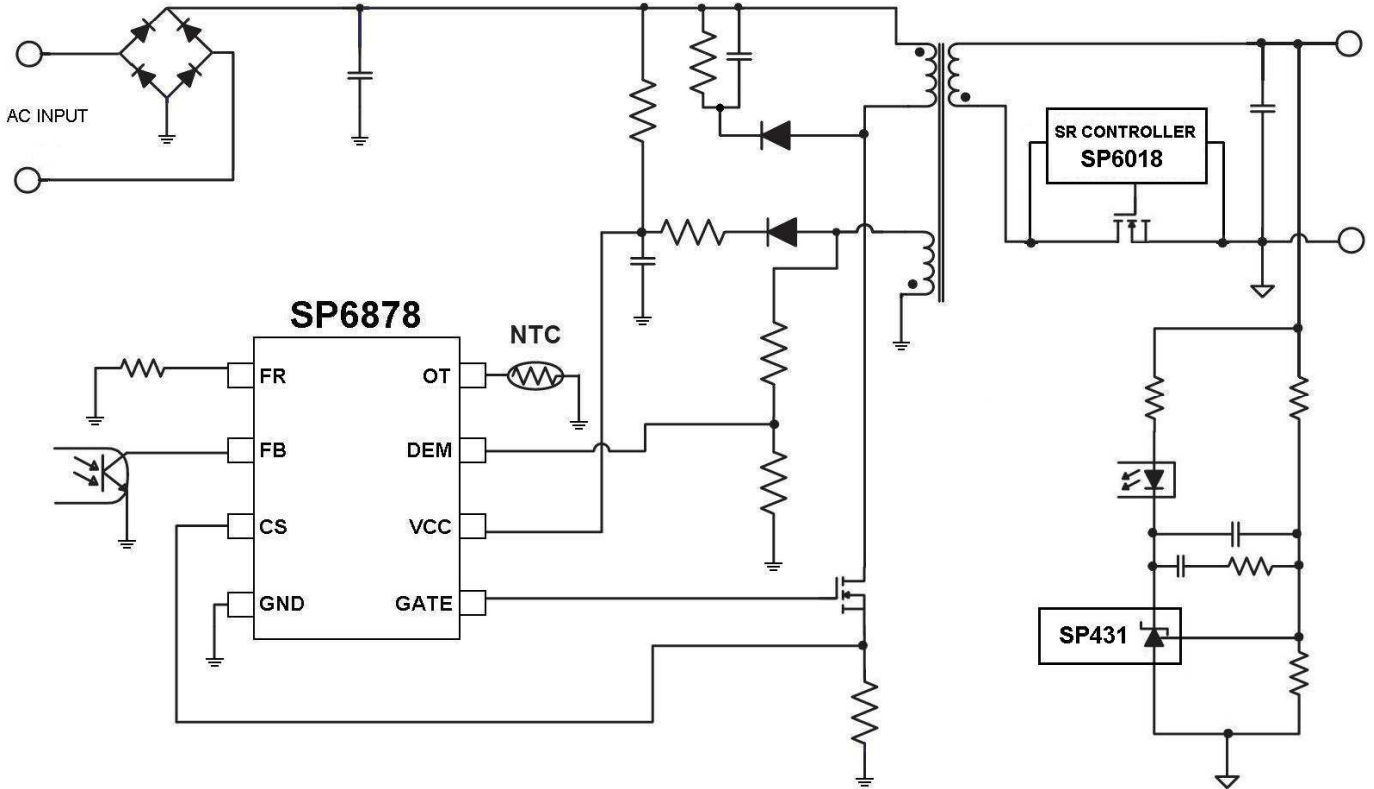
SOP-8/DIP-8P





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TYPICAL APPLICATION CIRCUIT FOR HIGH EFFICIENCY SMPS



PIN DESCRIPTION

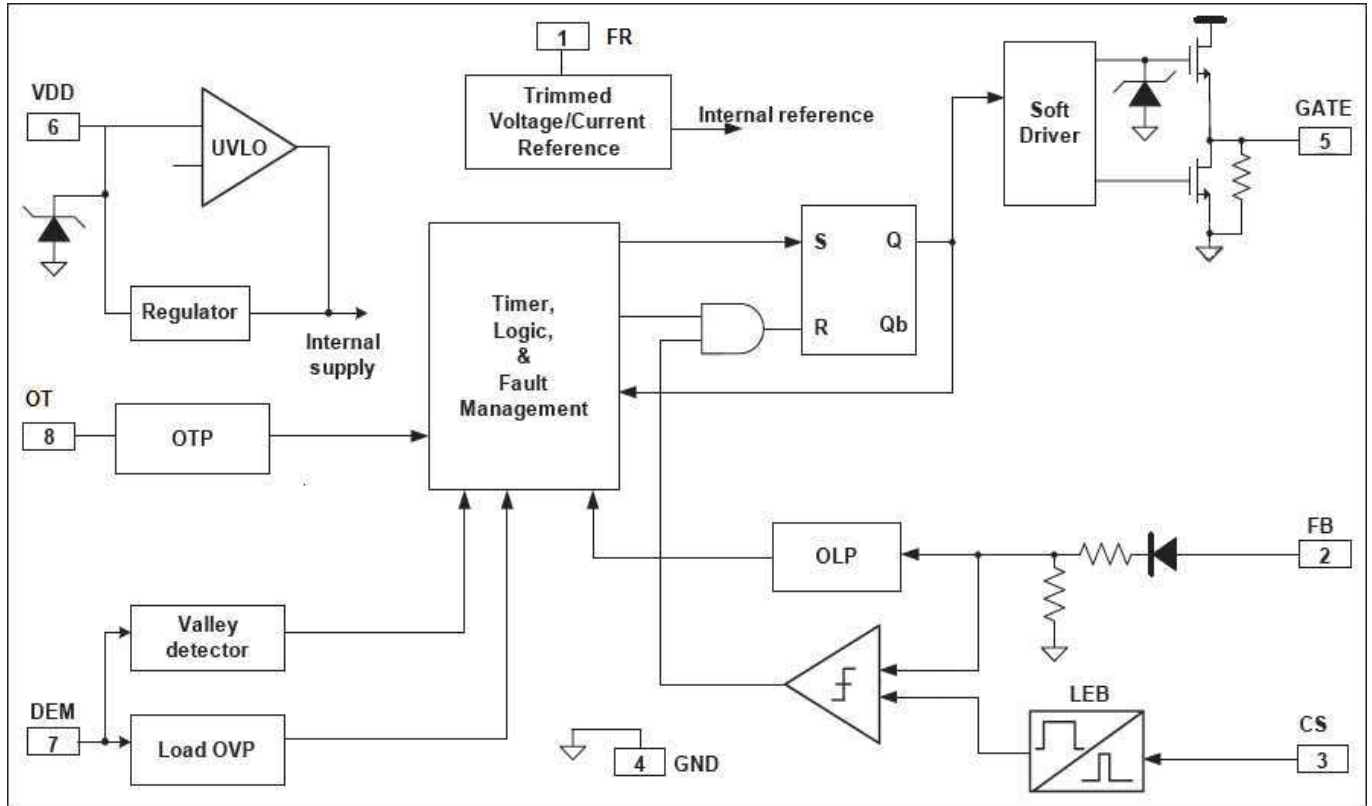
Pin	Symbol	Description
1	FR	Set the internal frequency and timer.
2	FB	Voltage feedback. It provides feedback to the internal PWM comparator to control the duty cycle.
3	CS	Current sense.
4	GND	Ground
5	GATE	Gate driver output to drive the external MOSFET.
6	Vcc	Supply voltage for the IC
7	DEM	Core reset detection and OVP.
8	OT	Over Temperature Protection by connection through a NTC resistor to GND.



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BLOCK DIAGRAM



ORDERING INFORMATION

Part Number	Package	Part Marking
SP6878D8TGB	DIP-8	SP6878
SP6878S8RGB	SOP-8	SP6878

※ SP6878D8TG : Tube ; Pb – Free ; Halogen-Free

※ SP6878S8RGB : Tape Reel ; Pb – Free ; Halogen-Free

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}	DC Supply Voltage	25	V
V _{FR/FB/CS/DEM/OT}	FR /FB / CS/DEM/OT Voltage	-0.3 ~ 7.0	V
ESD	Human Body Model	4	KV
	Machine Model	300	V
T _{ope}	Operating Ambient Temperature	-40 ~ 85	°C
T _J	Operating Junction Temperature Range	-40 ~ 150	°C
T _{STG}	Storage Temperature Range	-40 ~ 150	°C
T _{LEAD}	Pb-Free Lead Soldering Temperature for 5 sec.	260	°C
R _{θJC}	Thermal Resistance Junction – Case (*)	SOP-8	150
		DIP-8	90

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



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ELECTRICAL CHARACTERISTICS

($T_A=25^{\circ}\text{C}$, $V_{CC}=16\text{V}$, $R_{FR} = 20\text{K Ohm}$ unless otherwise specified.)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Supply Voltage (Vcc Pin)						
I _{stt}	Startup Current	$V_{CC}=UVLO-1.5\text{V}$		5	15	uA
I _{op}	Operating Current	$V_{FB} = 3\text{V}$		2.0	4.0	mA
		$V_{FB} = 3\text{V}, C_L = 1\text{nf}$		3.0	5.0	mA
UVLO (off)	Min. Operating Voltage			7.5		V
UVLO (on)	Start Threshold Voltage			13.5		V
OVP Level	Over Voltage Protection			20		V
V _{cc} Clamp	Clamping Voltage	$I_{VCC} = 5\text{mA}$		21		V
Voltage Feedback (FB Pin)						
I _{sc}	Short Circuit Current			1.5		mA
V _{op}	Open Loop Voltage			5.3		V
V _{TH_BM_on}	Burst Mode on threshold			0.8		V
V _{TH_BM_off}	Burst Mode off threshold			0.7		V
Z _{FB}	Input Impedance			4		K Ω
TL _{OLP}	OLP Trip Level			4.4		V
TD _{OLP}	OLP Delay Time (note)			80		mS
Demagnetization (DEM Pin)						
V _{TH(DEM)}	Demagnetization Threshold Voltage			75		mV
V _{CH}	Input Clamp Voltage High			6		V
V _{CL}	Input Clamp Voltage Low			-0.7		V
T _{supp}	Suppression of the transformer ringing at start of secondary stroke			2.5		uS
T _{DEM}	Demag Propagation Delay			250		nS
V _{TH_OVP}	Output OVP trigger point			3.75		V
Current Sensing (CS Pin)						
V _{TH_Duty_zero}	Internal current limiting threshold	Zero duty cycle, $V_{FB}=3\text{V}$	0.415	0.45	0.485	V
V _{TH_Duty_max}	Internal current limiting threshold	Max duty cycle, $V_{FB}=3\text{V}$		0.8		V
V _{TH_CS_min}	Burst mode CS threshold	Zero Output, $V_{FB}=1\text{V}$		0.3		V
TL _{EB}	Leading Edge Blanking Time			100		nS
Gate Driver Output (GATE Pin)						
V _{OL}	Output Low Level	$V_{CC}=15\text{V}, I_o=100\text{mA}$			1	V
V _{OH}	Output High Level	$V_{CC}=15\text{V}, I_o=100\text{mA}$	7.5			V
V _{G_Clamp}	Output Clamp Voltage Level	$V_{CC}=18\text{V}$		16.5		
T _r	Rising Time	$C_L = 1\text{nf}$		80		nS
T _f	Falling Time	$C_L = 1\text{nf}$		30		nS
Frequency Setup (FR Pin)						
R _{FR}	Resistor Range			20		K Ω
V _{FR_open}	FR open voltage			2.0		V
F _{burst}	Burst mode switching frequency			22		KHz
F _{max_QR_L}	Frequency low clamp in QR mode		47	52	57	KHz
F _{min_QR_H}	Frequency high clamp in QR mode		82	90	98	KHz
G _{PFM}	PFM mode frequency modulation slope			90		KHz
$\Delta F(\text{shuffle})/F$	F _{min_QR_L} frequency shuffling range		-4		+4	%
T _{ON}	Maximum ON Time	$R_{FR} = 20\text{K}\Omega$	10	13	15	uS



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T _{OFF}	Maximum OFF Time	R _{FR} = 20 K Ω	40	55	75	μ S
Over Temp Protection (OT Pin)						
V _{OT_open}	OT pin open voltage			3.5		V
V _{TH(OTP)}	OTP Threshold Voltage		1.00	1.05	1.10	V
I _{OT}	Output Current of OT pin	R _{FR} = 20K Ω		100		μ A
Soft Start						
T _{soft}	Internal soft startup			4		mS

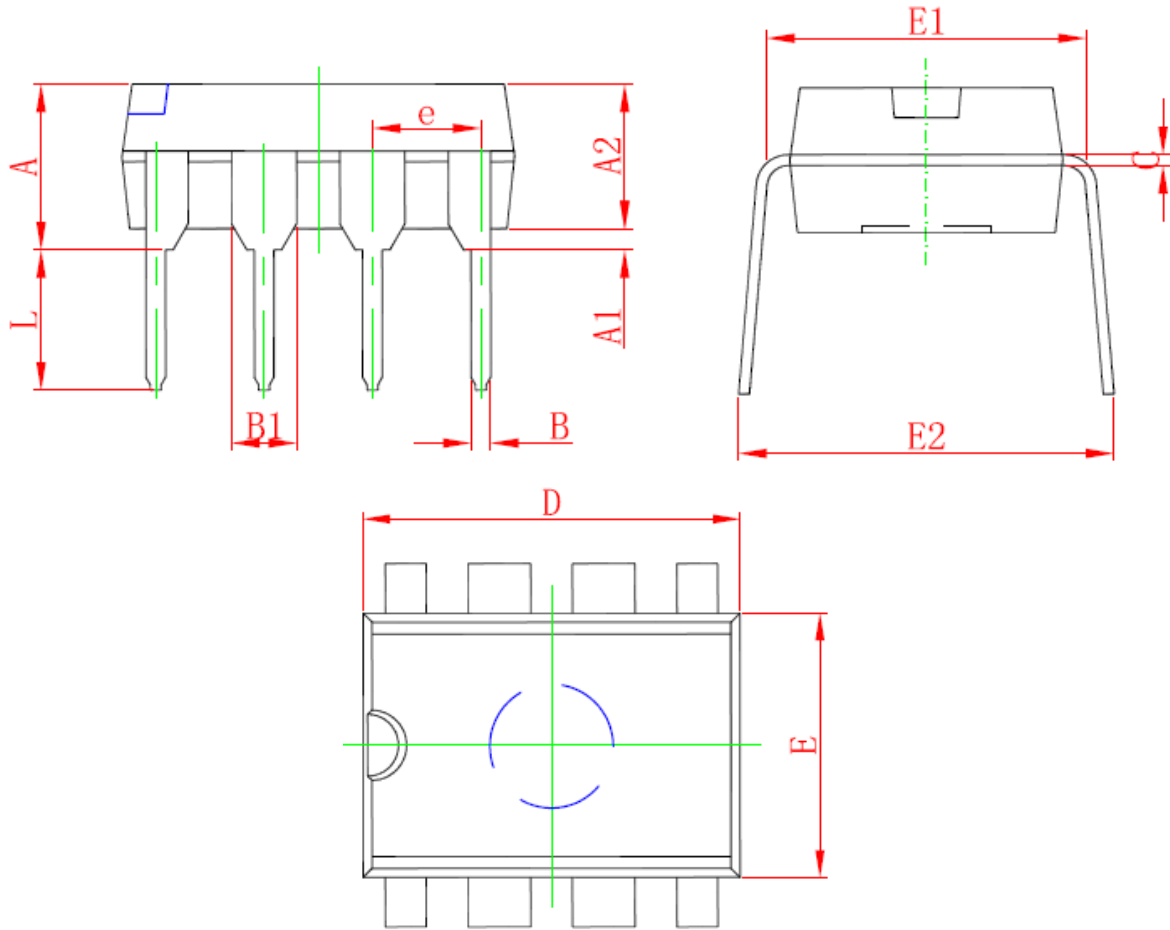
Note: The OLP delay time is proportional to the period of switching cycle. So that, the lower FR resistor value will set the higher switching frequency and the shorter OLP delay time.



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DIP- 8P PACKAGE OUTLINE



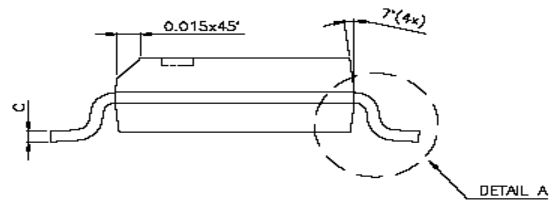
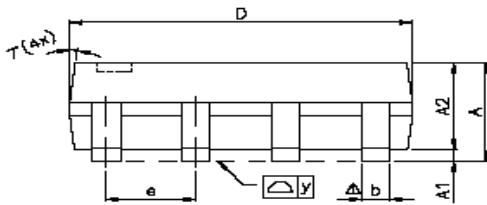
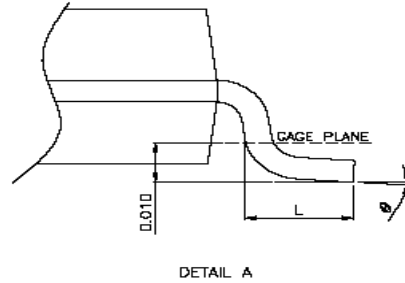
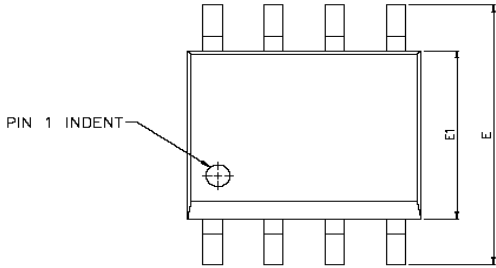
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	3.710	4.310	0.146	0.170
A1	0.510		0.020	
A2	3.200	3.600	0.126	0.142
B	0.380	0.570	0.015	0.022
B1	1.524 (BSC)		0.060 (BSC)	
C	0.204	0.360	0.008	0.014
D	9.000	9.400	0.354	0.370
E	6.200	6.600	0.244	0.260
E1	7.320	7.920	0.288	0.312
e	2.540 (BSC)		0.100 (BSC)	
L	3.000	3.600	0.118	0.142
E2	8.400	9.000	0.331	0.354



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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
Δ y	—	—	0.076	—	—	0.003
θ	0°	—	8°	0°	—	8°



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