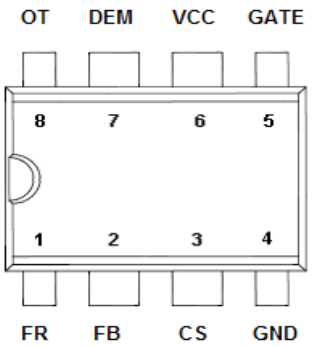
SP6878
Quasi-Resonant PWM Controller

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. The build-in advanced energy saving function 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

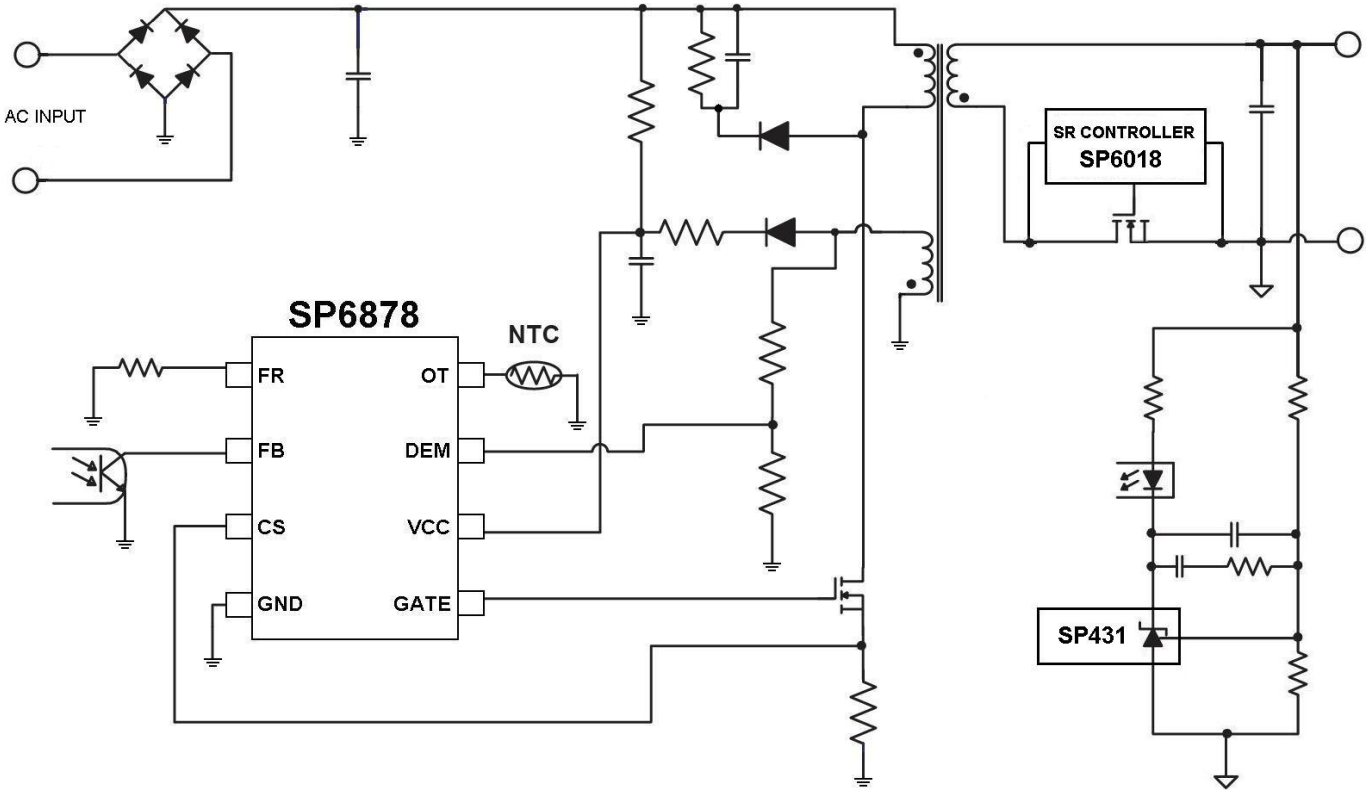
PIN CONFIGURATION
SOP-8/DIP-8



PART MARKING
SOP-8/DIP-8P

A : Lot Code
B : Date Code

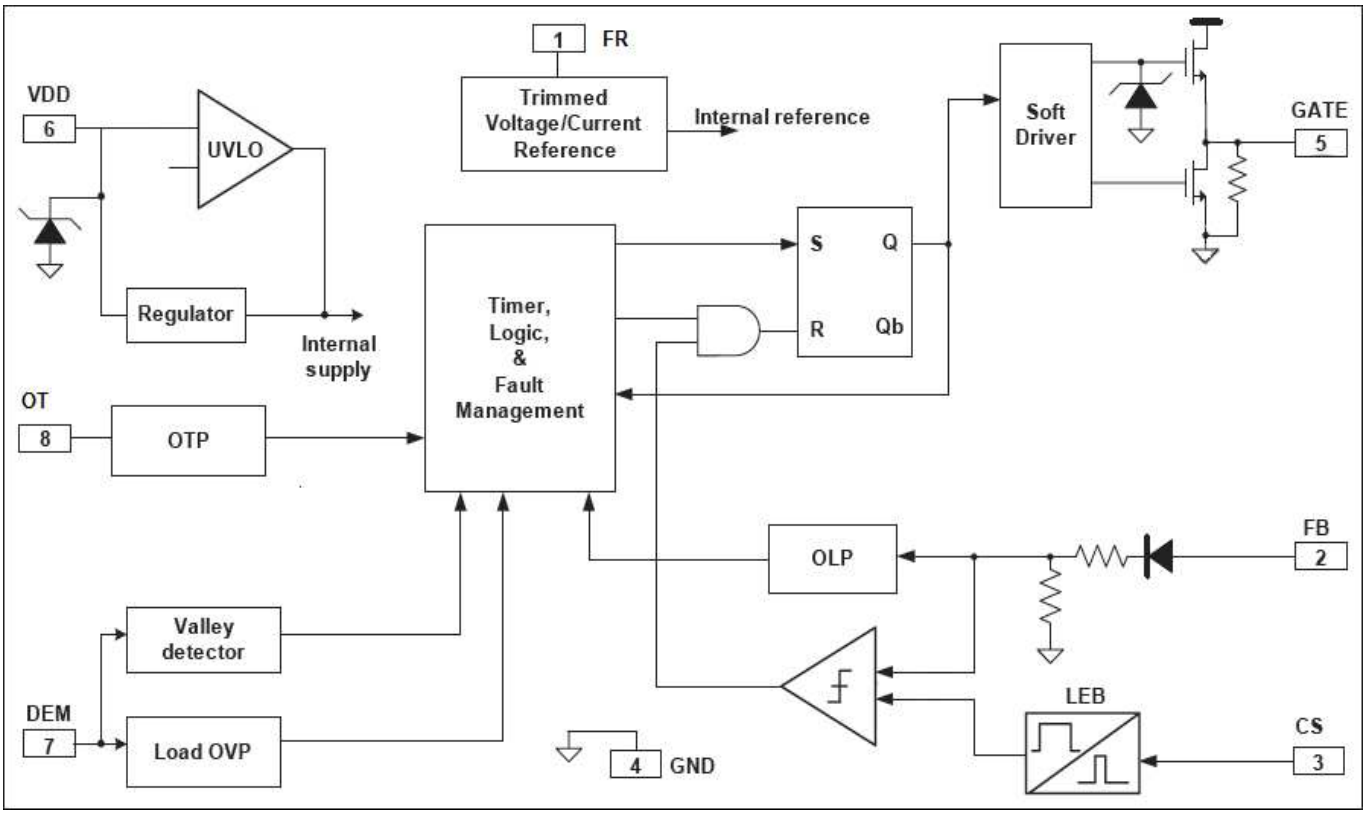
TYPICAL APPLCATION CIRCUIT FOR HIGH EFFICIENCY SMPS



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.

BLOCK DIAGRAM



ORDERING INFORMATION

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

※ SP6878D8TGB : Tube ; Pb – Free ; Halogen-Free

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

ABSOULTE MAXIMUM RATINGS (T_A=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		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	℃
T_J	Operating Junction Temperature Range		-40 ~ 150	℃
T_{STG}	Storage Temperature Range		-40 ~ 150	℃
T_{LEAD}	Pb-Free Lead Soldering Temperature for 5 sec.		260	℃
$R_{\Theta JC}$	Thermal Resistance Junction – Case (*)	SOP-8	150	℃/W
		DIP-8	90	

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

ELECTRICAL CHARACTERISTICS

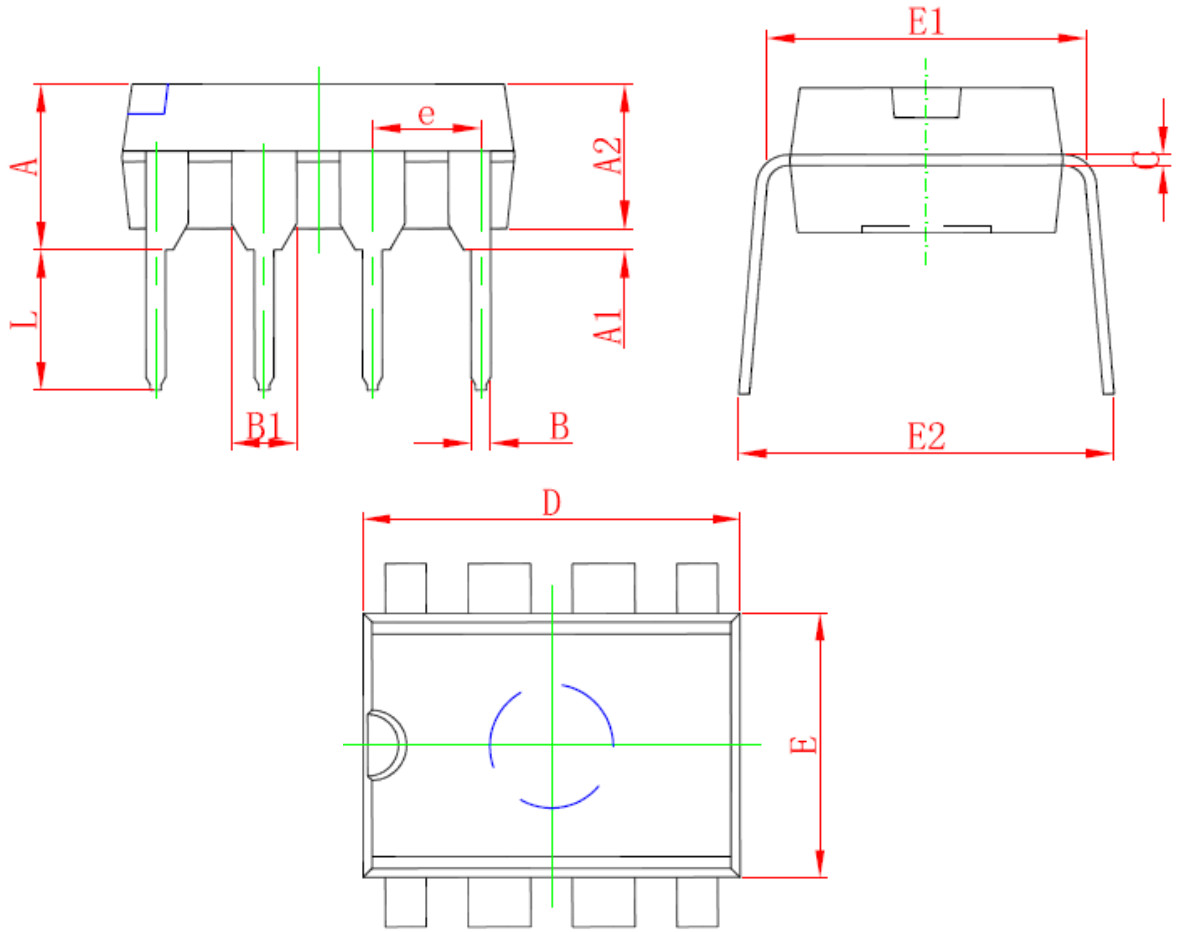
(T_A=25℃, V_{CC}=16V, R_{FR} = 20K Ohm unless otherwise specified.)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Supply Voltage (Vcc Pin)						
Istt	Startup Current	Vcc=UVLO-1.5V		5	15	uA
Iop	Operating Current	V_{FB} = 3V		2.0	4.0	mA
		V_{FB} = 3V, C_L = 1nf		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			19		V
Vcc Clamp	Clamping Voltage	I_{VCC} = 5mA		20		V
Voltage Feedback (FB Pin)						
Isc	Short Circuit Current			1.5		mA
Vop	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		KΩ
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
VC_H	Input Clamp Voltage High			6		V
VC_L	Input Clamp Voltage Low			-0.7		V
Tsupp	Suppression of the transformer ringing at start of secondary stoke			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}=3V	0.415	0.45	0.485	V
$V_{TH\_}$ Duty_max	Internal current limiting threshold	Max duty cycle, V_{FB}=3V		0.8		V
$V_{TH\_}$ CS_min	Burst mode CS threshold	Zero Output, V_{FB}=1V		0.3		V
T_{LEB}	Leading Edge Blanking Time			300		nS
Gate Driver Output (GATE Pin)						
V_{OL}	Output Low Level	V_{CC}=15V, Io=100mA			1	V
V_{OH}	Output High Level	V_{CC}=15V, Io=100mA	7.5			V
VG_Clamp	Output Clamp Voltage Level	Vcc=18V		16.5		
Tr	Rising Time	C_L = 1nf		80		nS
Tf	Falling Time	C_L = 1nf		30		nS
Frequency Setup (FR Pin)						
R_{FR}	Resistor Range			20		KΩ
V_FR_open	FR open voltage			2.0		V
Fburst	Burst mode switching frequency			22		KHz
Fmax_QR_L	Frequency low clamp in QR mode		47	52	57	KHz
Fmin_QR_H	Frequency high clamp in QR mode		82	90	98	KHz
G_PFM	PFM mode frequency modulation slope			90		KHz
ΔF(shiffle) /F	Fmin_QR_L frequency shuffling range		-4		+4	%
T_{ON}	Maximum ON Time	R_{FR} = 20 KΩ	10	13	15	uS

T_{OFF}	Maximum OFF Time	R_{FR} = 20 KΩ	40	55	75	uS
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} = 20KΩ		100		uA
Soft Start						
T_soft	Internal soft startup			4		mS

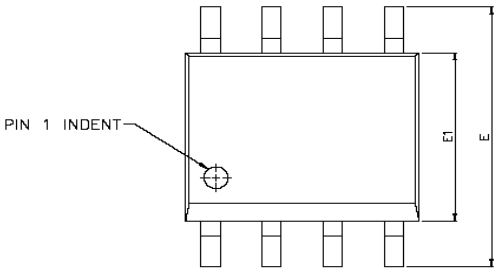
Note: The OLP delay time is proportional to the period of switching cycle. So that, the lower FR resistor value will set the higher switching frequency and the shorter OLP delay time.

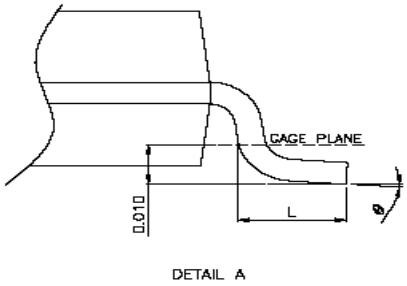
DIP- 8P PACKAGE OUTLINE

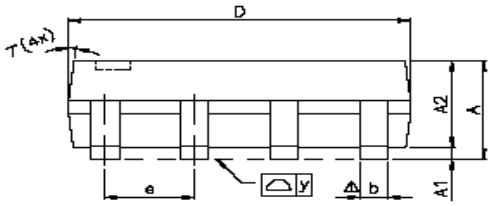


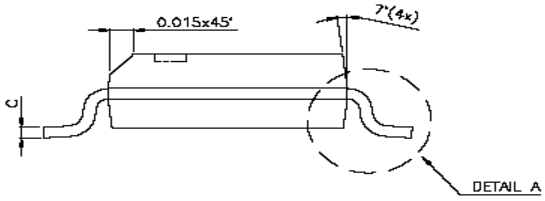
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	3.710	4.310	0.146	0.170
A1	0.510		0.020	
A2	3.200	3.600	0.126	0.142
B	0.380	0.570	0.015	0.022
B1	1.524 (BSC)		0.060 (BSC)	
C	0.204	0.360	0.008	0.014
D	9.000	9.400	0.354	0.370
E	6.200	6.600	0.244	0.260
E1	7.320	7.920	0.288	0.312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

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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