Features

- Built-in700- 850V BJT
- Quasi-Resonant Primary Side Regulation (QR-PSR) Control withHigh Efficiency
- Standby power<70mw
- Low start-up current<1uA
- High efficiency(Meet Energy Star 6.0)
- Multi-Mode PSR Control
- Fast Dynamic Response
- Built-in Dynamic Base Drive
- Audio Noise Free Operation
- ±5% CC and CV Regulation
- Programmable Cable Drop Compensation (CDC) in CV Mode
- Built-in AC Line & Load CC Compensation
- Build in Protections:
  - Short Load Protection (SLP)
  - Cycle-by-Cycle Current Limiting (OCP)
  - Leading Edge Blanking (LEB)
  - On-Chip Thermal Shutdown (OTP)
  - VDD OVP & UVP & Clamp

General Description

The SP6538X is a high performance AC/DC power supply controller for battery charger and adapter applications.The SP6538X uses Pulse Frequency Modulation (PFM) method to build discontinuous conduction mode (DCM) fly-back power supplies.

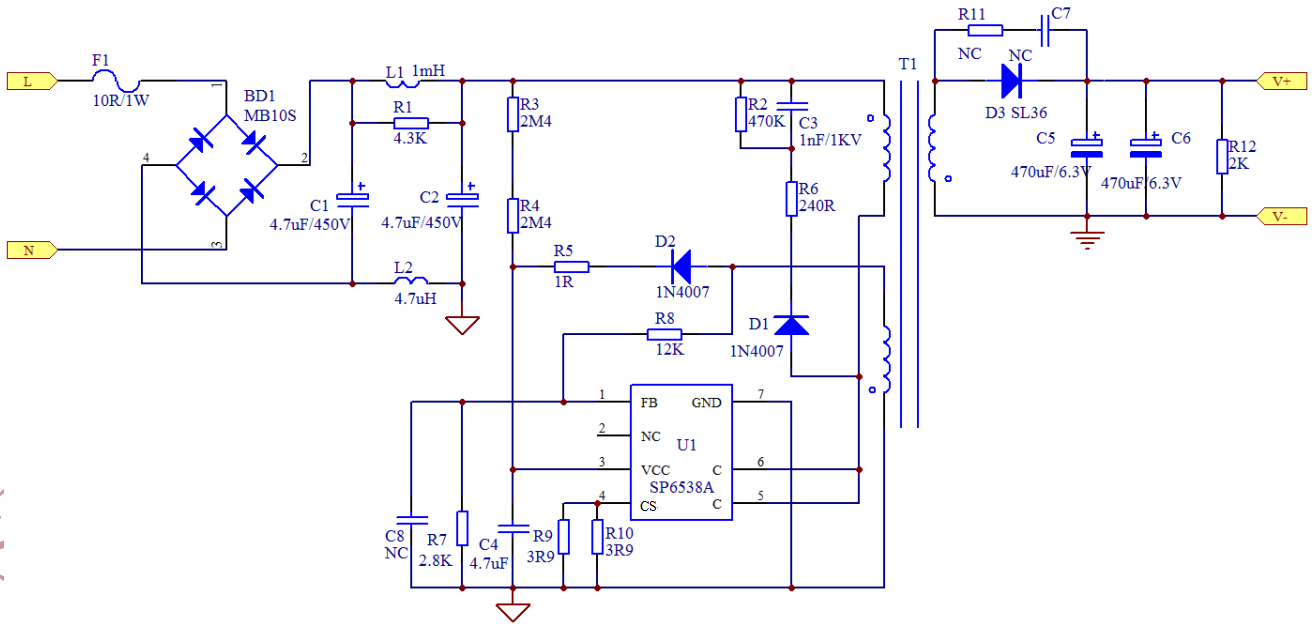
The SP6538X provides accurate constant voltage, constant current (CV/CC) regulation without requiring an opto-coupler and the secondary control circuitryTheSP6538X can achieve excellent regulation and high average efficiency, meet Energy star level 6.0.

The SP6538X has a proprietary cable voltage dropcompensation function. Internal random frequency modulation to reduce system EMI.

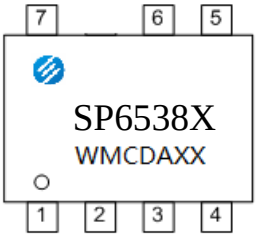
The SP6538X integrates functions and protections of Under Voltage Lockout (UVLO), VDD over Voltage Protection (VDD OVP), Cycle-by-cycle Current Limiting (OCP), Short Load Protection (SLP), On-Chip Thermal Shutdown, VDD Clamping, etc

The SP6538X is available in SOP-7 package.

Typical Application



Pin Assignment Marking



SOP-7

Recommended Operation Conditions

Part Number	Packing	230VAC ± 15%(2)	85-265Vac
		Adapter[2]	Adapter
SP6538A	SOP-7	4W	3W
SP6538B		6.5W	5W
SP6538C		12W	10W

Note 1. The Max.output power is limited by junction temperature
Note 2. Typical continuous power in a non-ventilated enclosed adapter with sufficient drain pattern as a heat sink at 50℃ ambient.

Pin Description

Pin	Pin Name	Description
FB	1	Feedback input
NC	2	Not Connect
VDD	3	IC Supply Voltage input
CS	4	Current sense input
C	5/6	Collector of internal BJT
GND	7	IC Ground

Absolute Maximum Ratings

Parameter	Symbol	Parameter Range	Unit
C pin Voltage(C) (SP6538A)	V_C	-0.3~700	V
C pin Voltage(C)(SP6538B)		-0.3~850	V
C pin Voltage(C)(SP6538C)		-0.3~800	V
Supply Voltage（VCC）	V_{VCC}	25	V
FB pin Voltage （FB）	V_{FB}	-0.7~7	V
CS pin voltage （CS）	V_{CS},V_E	-0.3~7	V
OUT pin output current	I_{OUT}	Internal limited	A
Maximum Power Dissipation (Ta=25°C)	P_{tot}	0.45@ SOP-7	W
Thermal Resistance Junction-ambient	Rthj-a	145@ SOP-7	℃/W
Operating Junction Temperature	T_J	-40～150	℃
Storage Temperature Range	T_{STG}	-55～150	℃
V_{ESD_HBM}	Human Body Model	2,000	V
V_{ESD_MM}	Machine Model	200	V

Note 1: Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Exposure to Absolute Maximum Rating conditions for extended periods may affect device reliability。

Recommended Operation Conditions

Parameter	Value	Unit
Supply Voltage, VCC	7 to 21	V
Operating Ambient Temperature	-40 to 85	oC
Maximum Switching Frequency @ Full Loading	70	kHz
Minimum Switching Frequency @ Full Loading	35	kHz

Note2. The device is not guaranteed to function outside its operating conditions.

Electronic Characteristics

T_C =25°C,V_{CC} = 20V,unless otherwise specified

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
Supply Voltage Section(V_{CC} Pin)						
IVCC_st	Start-up current into VCC pin			3	20	uA
IVCC_Op	Operation Current			0.8	1.5	mA
IVCC_standby	Standby Current			0.5	1	mA
VCC_ON	VCC Under Voltage Lockout Exit		10.5	12	13.5	V
VCC_OFF	VCC Under Voltage Lockout Enter		5.5	6.5	7	V
VCC_OVP	VCC OVP Threshold		22	24	26	V
VCC_Clamp	VCC Zener Clamp Voltage	I(VCC) = 7 mA	23.5	25.5	27.5	V
Control Function Section (FB Pin)						
V_{FBREF}	Internal Error Amplifier (EA) Reference Input		1.97	2.0	2.03	V

V_{FB_SLP}	Short Load Protection (SLP) Threshold			0.65		V
T_{FB_Short}	Short Load Protection (SLP) Debounce Time			36		ms
V_{FB_DEM}	DemagnetizationComparator Threshold			25		mV
T_{off_min}	Minimum OFF time			2		us
T_{on_max}	Maximum ON time			20		us
T_{off_max}	Maximum OFF time			5		ms
I_{Cable_max}	Maximum Cable Drop Compensation(CDC) Current			60		uA
T_{SW} /T_{DEM}	Ratio between Switching Period and Demagnetization Time in CC Mode			7/4		
Current Sense Input Section (CS Pin)						
T_{LEB}	CS Input Leading Edge Blanking Time			500		ns
$V_{cs(max)}$	Current limiting threshold		490	500	510	mV
T_{D_OC}	Over Current Detection and Control Delay			100		ns
Power BJT Section (C Pin)						
BV_{CBO}	Collector-BaseBreakdown Voltage	SP6538A	700	-		V
		SP6538B	850	-		V
		SP6538B	800	-		V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	Ic=0.3A(SP6538A)			0.8	V
		Ic=1.5A(SP6538B)			0.85	V
		Ic=2.0A(SP6538C)			1.0	V
Ic	Maximum Collector Current	SP6538A		0.5		A
		SP6538B		2.0		A
		SP6538C		3.0		A
On-Chip Thermal Shutdown						
T_Z	Intelligent Thermal Control Threshold	Output Power Shut Down	---	155	--	℃
T_{OTP}	OTP Threshold	Restart		140	--	℃