SP6086
Synchronous Rectifier Driver

DESCRIPTION

The SP6086 is a low-drop diode emulator IC. By combining with an external switch, it replaces Schottky diodes in high-efficiency flyback converters.

The SP6086 generates its own supply voltage and does not need auxiliary winding for either high-side or low-side applications. Programmable ringing detection circuitry prevents the SP6086 from false turning on at V_{DS} oscillations during discontinuous conduction mode (DCM) and quasi-resonant (QR) operation. It has a timing pin to allow SP6086 to turn on at a selected load.

SP6086 is available in space saving SOT-23-6L package.

APPLICATIONS

- Industrial Power Systems
- Distributed Power Systems
- Battery Powered Systems
- Flyback Converters
- USB PD Quick Chargers

FEATURES

- Does not need auxiliary winding for either high-side or low-side applications
- Fast turn-on and turn-off delay
- Ringing detection prevents false turn-on during DCM and QR operations
- Less than 100mW standby power
- <400uA quiescent current at light load mode
- Supports CCM, DCM and QR operation
- Support both high-side and low-side rectification
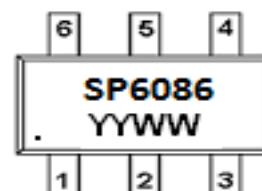- Available in space saving SOT-23-6L package

PIN CONFIGURATION (SOT-23-6L)

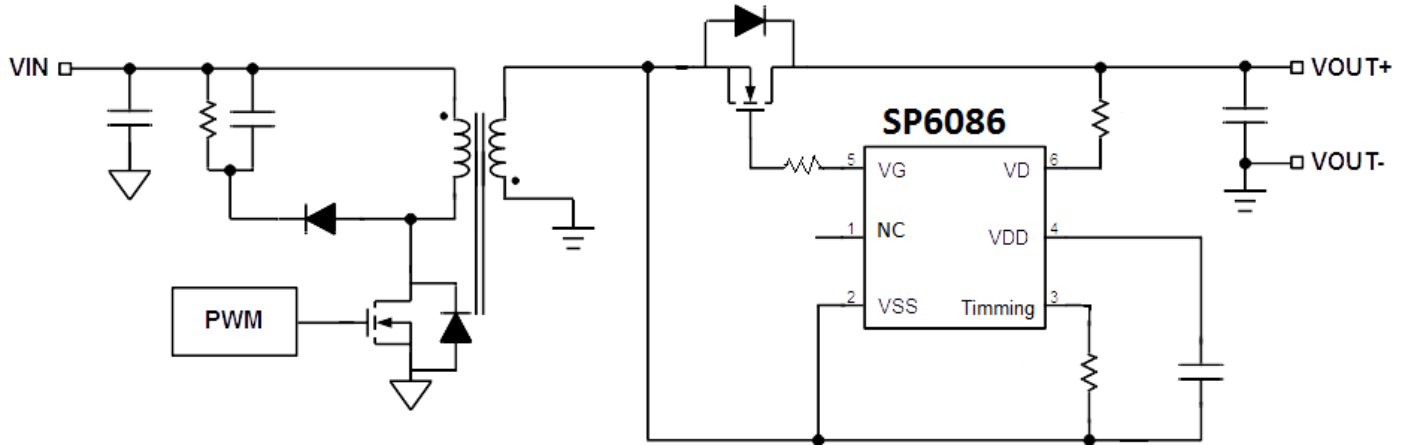| Pin	Name		Pin	Name
1	NC		6	VD
2	VSS		5	VG
3	Timing		4	VDD
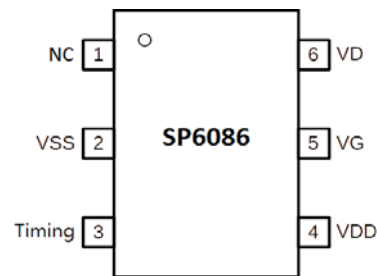
PART MARKING

SP6086
YYWW

Y : Year Code
W : Week Code

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TYPICAL APPLICATION CIRCUIT

PIN DESCRIPTION

Pin No.	Pin Name	Description
1	NC	
2	VSS	Ground, also used as reference for VD
3	Timing	Discontinuous current filter timing adjustment by a resistor
4	VDD	Linear regulator output. Supply voltage for internal circuits
5	VG	Gate driver output
6	VD	External FET drain voltage sensing and input of linear regulator

ORDERING INFORMATION

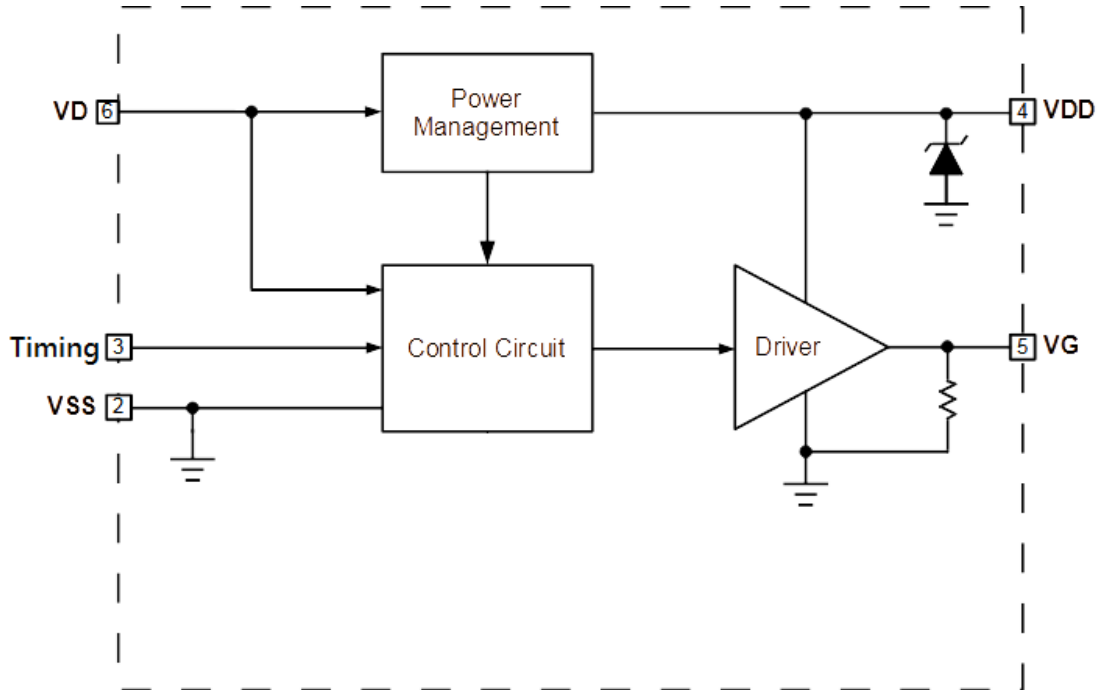| Part Number	Package	Part Marking
SP6086S26RGB	SOT-23-6L	SP6086

※ SP6086S26RGB : Tape Reel ; Pb – Free ; Halogen – Free

BLOCK DIAGRAM

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

Symbol	Parameter	Value	Unit
V_{dd}	VDD, VG and SL pins voltages to VSS	$-0.3 \sim 8.0$	V
V_D	VD pin voltage to VSS	$-0.7 \sim 200$	V
P_D	Power Dissipation @ $T_A=85℃$ (*)	0.3	W
T_J	Junction temperature	$-40 \sim 150$	°C
T_{STG}	Storage temperature	$-40 \sim 150$	°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	℃/W
$R_{\theta JC}$	Thermal Resistance Junction –to Case (*2)	110	℃/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

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ELECTRICAL CHARACTERISTICS

(T_A=25°C, V_{DD}=5.5V, unless otherwise specified)

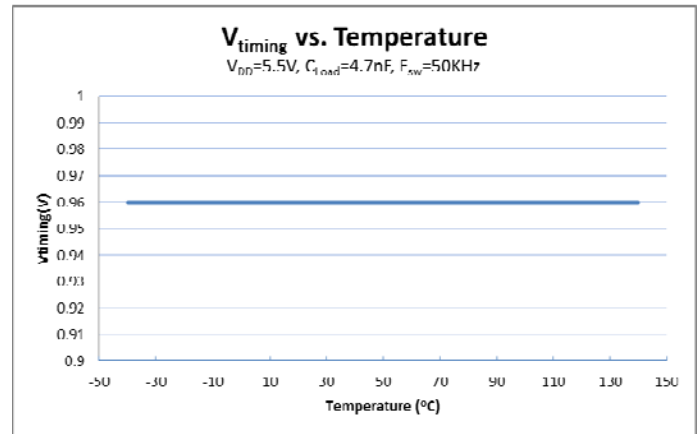| Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Supply Section						
UVLO	VDD UVLO rising		3.5	4	4.5	V
	VDD UVLO Hysteresis		0.1	0.3	0.5	V
	VDD clamp voltage	I_{DD} = 10mA		7.5		V
I_{VD}	VDD charging current	V_D = 20V, V_{DD} = 0V		20		mA
		V_D= 20V, R_{VDD}=1KΩ		7		mA
	VDD regulation voltage	V_D = 20V	5.7	6.1	6.5	V
I_{CC}	Operating current	C_{LOAD}=4.7nF, F_{SW}=50kHz		5		mA
	Shutdown current	V_{DD}=UVLO − 0.5V			50	uA
$I_{STANDBY}$	Light-load mode current	R_{timing}=100kΩ		250	400	uA
Control Circuitry Section						
V_{LL-DS}	VSS-VD turn-on threshold			230		mV
V_{fwd}	VSS-VD forward voltage			20		mV
	VSS-VD turn-off threshold			3		mV
T_{Don}	Turn-on delay	C_{LOAD}=5nF, V_{GS}=2V			75	ns
		C_{LOAD}=10nF, V_{GS}=2V			100	ns
	Turn-off propagation delay(*)	V_D=V_{SS}		15		ns
T_{Doff}	Turn-off total delay	V_D=V_{SS}, C_{LOAD}=5nF, R_{GATE}=0Ω, V_{GS}=2V		30		ns
		V_D=V_{SS}, C_{LOAD}=10nF, R_{GATE}=0Ω, V_{GS}=2V		40		ns
T_{Bon}	Turn-on blanking time			1.2		us
V_{Boff}	Turn-off blanking V_{DS} threshold		1.5		2.5	V
T_{timing}	Falling slope detection timer	R_{timing}=100kΩ, V_D transition from 2V to 0.35V		30		ns
V_{timing}	Reference voltage	R_{timing}=100kΩ,	0.88	0.94	1	
T_{LL1}	Light-load-enter pulse width			1.9		us
T_{LL1-H}	Light-load-enter pulse width hysteresis			0.5		us
T_{LL2}	Light-load-enter pause width			1		ms
T_{LL-DEL}	Light-load-enter delay			6		cycle
Gate Driver Section						
V_{G-L}	Gate output low voltage	I_{LOAD}=1mA			0.1	V
V_{G-H}	Gate output high voltage		6			V
	Peak source current(*)			0.5		A
	Peak sink current(*)			3		A
	Pull down impedance			1		Ω

Notes:

(*)Guaranteed by design and characterization.

TYPICAL CHARACTERISTICS

Light Load Current vs. Temperature

V_{DD}=5.5V, C_{Load}=4.7nF, F_{SW}=50KHz

Charging VDD vs. Temperature

Cvdd= 1uF, VD=20V

Operating Current vs. Temperature

V_{DD}=5.5V, C_{Load}=4.7nF, F_{SW}=50KHz

V_{timing} vs. Temperature

V_{DD}=5.5V, C_{Load}=4.7nF, F_{SW}=50KHz

Turn on delay vs. Temperature

V_{DD}=5.5V, C_{Load}=4.7nF, F_{SW}=50KHz

R_{timing} vs. T_{timing}

V_{DD}=5.5V, C_{Load}=4.7nF, F_{SW}=50KHz
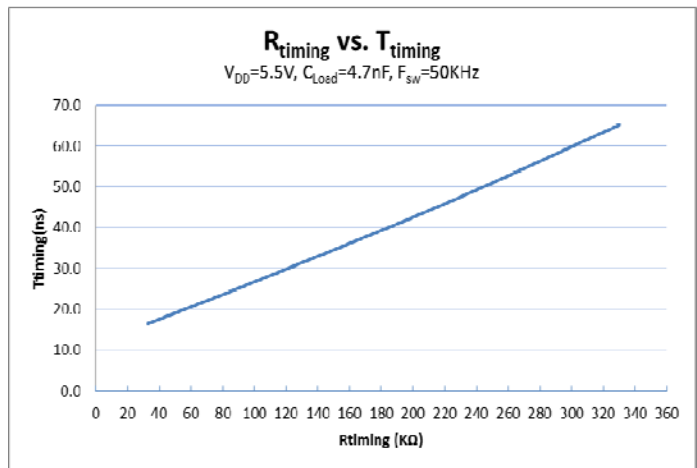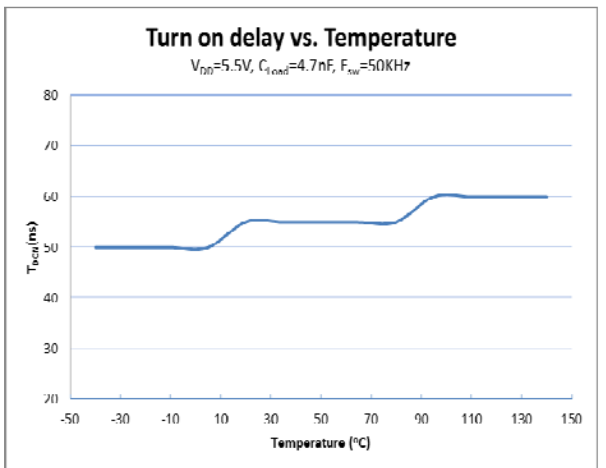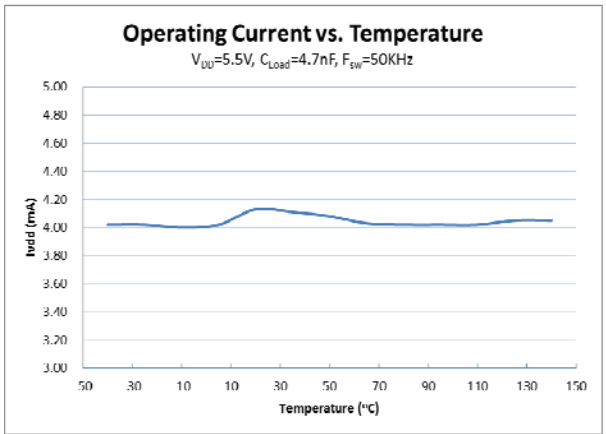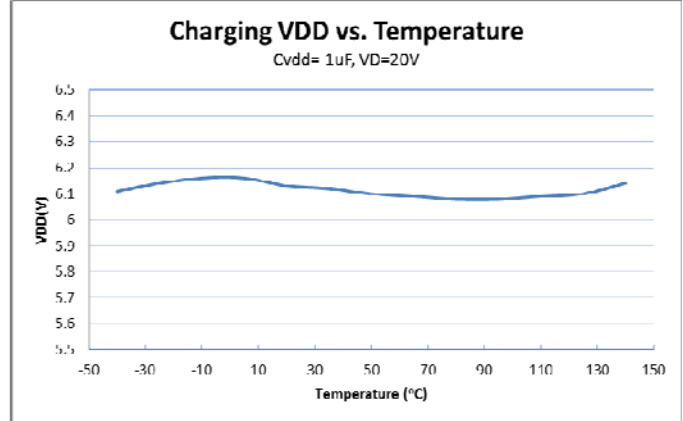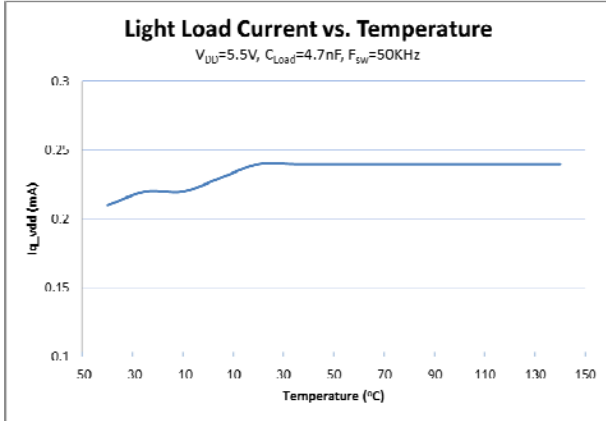
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