PS235S

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2-Channels Secondary Monitoring IC

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PS235S

2-Channels Secondary Monitoring IC

General Description

PS235S is specially designed for two-channel power supply systems. It provides over-voltage protection, over-current protection, under-voltage protection, 5V/12V output control, over-temperature protection and timing control.

PS235S makes external circuit implementation easy and meanwhile provides high performance. It is usually complex with discrete components. since PS235S has an internal timing control when output is protected with timing control. The problem is solved with an internal timing control in PS235S

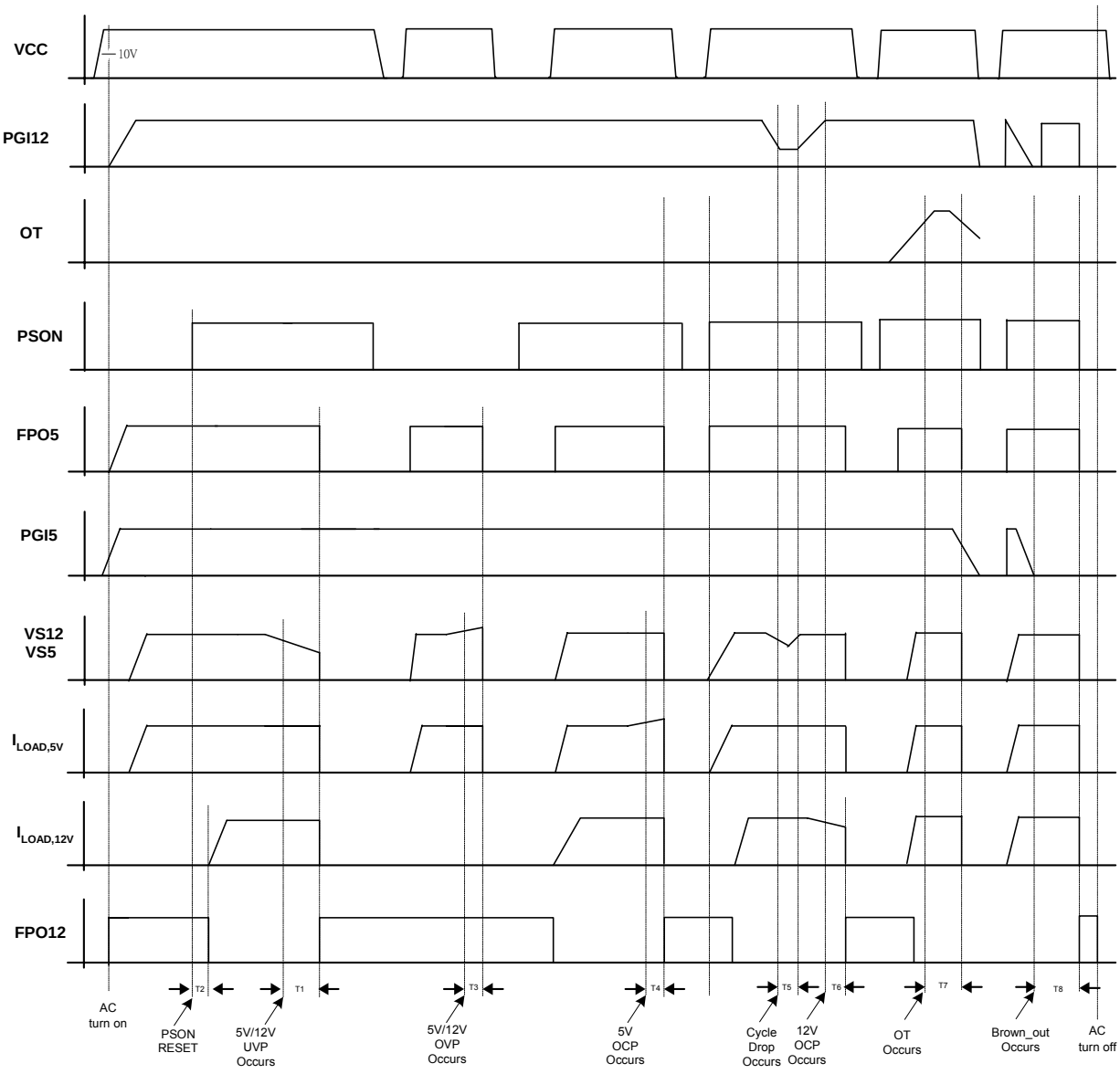
OVP/UVP (Over-Voltage/Under-Voltage protection) monitors 5V and 12V to protect the power supply system. When any output feedback loop error occurs, the output voltage will surge and thus cause damages on the system. With PS235S this problem can be avoided since The FPO signal state changes when the supply voltages exceeds their normal operation ranges.

OCP (Over Current Protection) monitors IS5 and IS12 input currents. The OCP is composed of "I_{ref}" and "protection current range resistor", and this adjustable over-current condition helps users to design OCP more easily.

Features

- Two winding detect function
- Over/Under-voltage protection and lock out
- Over-current protection and lock out
- Over temperature protect protection and lock out
- Fault protection output with open drain output stage
- Three states LEDs driver of power supply
- 175mS delay for 12V/5V SPS short-circuit protect
- 48mS PSON/ control de-bounce
- 20uS de-bounce for noise immunity
- Special care for AC power off

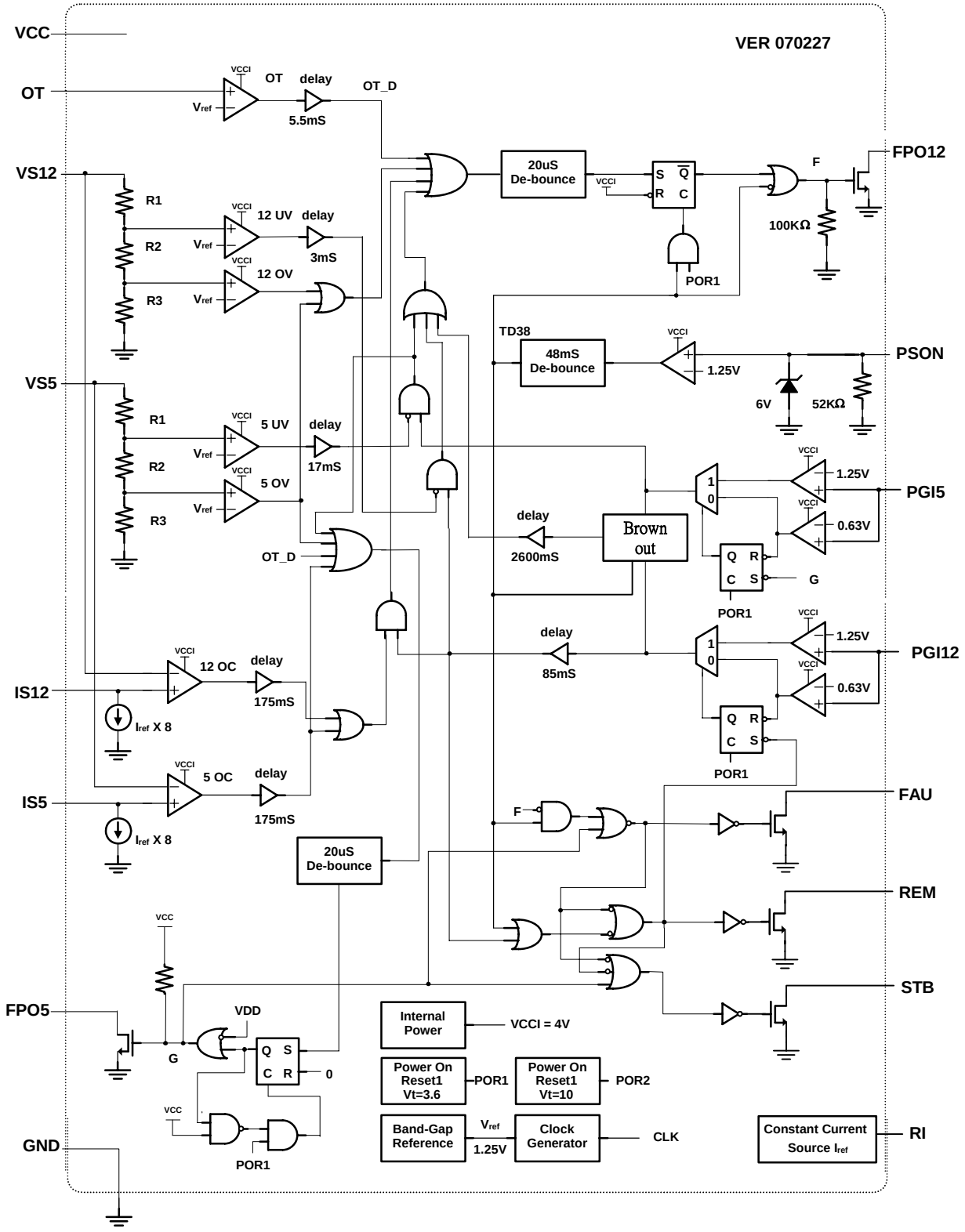
Timing Chart



Note:

T1 = 3mS for 12V , 17mS for 5V
T2 = 48mS
T3 = 20uS
T4 = 175mS
T5 = 85mS
T6 = 175mS
T7 = 5.5mS
T8 = 2600mS

Block Diagram



Pin Descriptions

Pin No	PIN NAME	Descriptions
1	PGI5	+5V power good input signal pin
2	GND	Ground
3	FPO5/	Open drain output stage to control +5V output
4	FPO12/	+12V Inverted fault protection output ,open drain output stage
5	PSON	Remote ON/OFF control input pin
6	REM	+12V output state LED driver
7	STB	Standby state LED driver
8	FAU	Power fault state LED driver
9	RI	Current sense setting
10	OT	Over-temperature protection
11	IS12	12V over current protection input pin
12	VS12	12V over/under voltage protection input pin
13	IS5	5.0V over current protection input pin
14	VS5	5.0V over/under voltage protection input pin
15	VCC	Power supply
16	PGI12	+12V power good input signal pin

Absolute Maximum Ratings

Parameter		PIN / SYMBOL	Rating			Unit
Storage Temperature	(T_{stg})		-40	to	+140	°C
Operating Temperature	(T_{opr})		-25	to	+125	°C
Junction Temperature	(T_j)			150		°C
Supply Voltage	(V_{CC})	VCC	-0.5	to	+18.0	V
Input Voltage Range	(V_I)	VS12, IS12	-0.5	to	+16.0	V
		VS5, IS5	-0.5	to	+7.0	V
		PGI	-0.5	to	+16.0	V
		OT	-0.5	to	+16.0	V
		PSON	-0.5	to	Vcc+0.5	V
Output Voltage Range	(V_O)	FPO5	-0.5	to	Vcc+0.5	V
		FPO12	-0.5	to	Vcc+0.5	V
		FAU,REM,STB	-0.5	To	+7.0	V
Output Current for RI	(I_{RI})	RI	12.5	to	62.5	uA
LED Drivers		V_{SAT}*1	-0.5		Vcc+0.5	V
Power Dissipation		PD		1.12		W
Thermal Resistance		θ_{JA}		85		°C/W

***1 FAU,REM,STB Pin**

Electrical Characteristics, Vcc=12V, T_a = -25 °C ~125 °C,

Power Supply Section

Parameter	Conditions	MIN	TYP	MAX	Unit
Supply Voltage (VCC)		10	15	18	V
Supply Current (I_{CC})	V_{PSON} = 3.3		2.5	4	mA
Reset Threshold Voltage	HIGH→LOW *2	2.6	3.0	3.4	V

*2 Hysteresis voltage included

Over-Voltage Section

Parameter		Conditions	MIN	TYP	MAX	Unit
Over-Voltage Threshold	VS5		5.7	6.0	6.3	V
	VS12		13.4	14.0	14.6	V

Under-Voltage Section

Parameter		Conditions	MIN	TYP	MAX	Unit
Under-Voltage Threshold	VS5		3.7	4.0	4.3	V
	VS12		10.0	10.5	11.0	V

Over-Current Section

Parameter		Conditions	MIN	TYP	MAX	Unit
Offset Voltage (OCP Comparator)	VS5, IS5		-3	0	+3	mV
	VS12, IS12		-4	0	+2	mV
Constant Current Generator Voltage (V_{RI})			1.21	1.27	1.33	V
OCP Bias Current	IS5	RI=62.5KΩ	148	158	168	uA
	IS12		148	158	168	uA

States LEDs driver

Parameter	Conditions	MIN	TYP	MAX	Unit
$V_{REM,SAT}$	I_{LED} = 20mA			1	V
$V_{FAU,SAT}$				1	V
$V_{STB,SAT}$				1	V

Electrical Characteristics (Continued)

PSON, Analog Input

Parameter	Conditions	MIN	TYP	MAX	Unit
Threshold Voltage	LOW→HIGH	1.30	1.55	1.80	V
Threshold Voltage	HIGH→LOW	0.80	1.00	1.20	V

PGI5, Analog Input (Brown out function)

Parameter	Conditions	MIN	TYP	MAX	Unit
Threshold Voltage of PGI5	Enable	0.62	0.72	0.82	V
	Brown out	1.12	1.22	1.32	V

PGI12, Analog Input (Brown out function)

Parameter	Conditions	MIN	TYP	MAX	Unit
Threshold Voltage of PGI12	Enable	0.62	0.72	0.82	V
	Brown out	1.12	1.22	1.32	V

FPO5, Open Drain Output

Parameter	Conditions	MIN	TYP	MAX	Unit
Leakage Current (I_{LKG})	V_{FPO5}=12V			5	uA
Low Level Output Voltage (V_{OL})	I_{SINK}=10mA			0.5	V

FPO12, Open Drain Output

Parameter	Conditions	MIN	TYP	MAX	Unit
Leakage Current (I_{LKG})	V_{FPO12}=12V			5	uA
Low Level Output Voltage (V_{OL})	I_{SINK}=10mA			0.5	V

OTP, Analog Input

Parameter	Conditions	MIN	TYP	MAX	Unit
Threshold Voltage	LOW→HIGH	1.28	1.34	1.40	V

Switching Characteristics, Vcc=12V, T_a = -25 °C ~125 °C

Parameter	SYMBOL	MIN	TYP	MAX	Unit
Under voltage protection delay time *	T1	2	3	4	mS
		12	17	22	
PSON De-bounce time	T2	34	48	62	mS
FPO12 / FPO5 noise De-glitch time	T3	10	20	30	uS
5V over current delay time	T4	135	175	215	mS
PGI12 OC/UV mask time	T5	60	85	110	mS
12V over current delay time	T6	135	175	215	mS
Over temperature protection delay time	T7	3	5.5	8	mS
Brown out delay time	T8	2000	2600	3200	mS

*** T1=17mS for 5V, T1=3mS for 12V**

Function Table

AC POWER	+5V CHANNEL			+12V CHANNEL				TEMP	OUTPUT CONTROL		LEDs STATE		
VDD	PGI5	OC5	OV5	PSON	PGI12	OC12	OV12	OT	FPO5	FPO12	STB	REM	FAU
VDD<3.6V	x*1	x	x	L	x	x	x	x	H	H	L	H	H
3.6<VDD<10V	x	x	x		x	x	x	NO	H	H	L	H	H
3.6<VDD<10V	x	x	x	H	x	x	x	NO	H	L	L	H	H
3.6<VDD<10V	x	x	x		x	x	x	YES	L	H	H	H	L
>10V	<0.63	x	NO	L	x	x	x	NO	H	H	L	H	H
		x	YES		x	x	x	NO	L	H	H	H	L
	>0.63	NO	NO		x	x	x	NO	H	H	L	H	H
		YES	x		x	x	x	NO	L	H	H	H	L
		x	YES		x	x	x	NO	L	H	H	H	L
	>1.27	NO		H	<0.63	x	NO	NO	H	L	H	L	H
						x	YES	NO	H	H	H	H	L
					>0.63	YES	x	NO	H	H	H	H	L
						x	YES	NO	H	H	H	H	L
	x	x	x	x	x	x	x	YES	L	H	H	H	L
	x	x	x	H	<1.27	x	x	NO	L	H	H	H	L
	<1.27*2	x	x	L	x	x	x	NO	L	H	H	H	L

*Note1: X = Do not care.

*Note2: The last two patterns only for Brown out function.

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Operation Description

- Power good function pin (PGI5/PGI12)
  PGI5 and PGI12 will enable the UVP and OCP function; if PGI is larger than the trigger point, the UVP and OCP will be enabled, otherwise the UVP/OCP function will be disabled when PGI is smaller than the trigger point. The PGI trigger point ranges from 0.62V change to 1.27V, and it will prevent the AC cycle drop to provide a mistake protection.

- Fault power output (FPO5/FPO12)
  The FPO5/FPO12 signals are the final protection signals; to control the 5V output and 12V output. When any power error occurs, the FPO state will change in accordance.

- Remote control (PSON)
  This pin controls the 12V output. When PSON is at logic high, FPO12 switches to logic low. The photodiode connected to FPO12 will be turned on, which causes the primary side PWM controller to be turned on.

- LED lights (FAU/REM/STB)
  There are three indicator lights in PS235S. When FAU pin switches to logic high, it means the power system fault occurs. When REM pin switches to logic high, it means the power system works normally with 12V output. When STB pin switches to logic high, it means the power system works normally with only 5V output.

- Over temperature protection (OT)
  OT pin is a high impedance input connected to a comparator, and the reference voltage is provided with the bandgap voltage which is equal to 1.34V nominally. If this OT pin voltage is higher than 1.34V, it means the power system fails, and the FPO5 and FPO12 switch to logic low whereas FAU switches to logic high.

- Over voltage protection (VS5/VS12)
  The VS5/VS12 pins detect the output voltage. If the 5V or 12V output over voltage is detected, the FPO and LED indicator signals will change in accordance.

- Brown out function

  When AC power decrease, the AC line current will increase, it may cause power coil damage. So PS235S provides the brown out function to avoid the power supply damaged. When PSON logic low, it monitor PGI5 and PSON logic high, it monitor PGI12. If PGI signal < 1.22, the delay block active (2600mS), FPO will latch.

- OCP setting

  We recommend the values of R_{S12} ≥ 5mΩ and R_{S5} ≥ 10mΩ. RI pin is connected to ground through a 62.5KΩ resistor. RI pin is a reference current generator and it can adjust the over current trigger point. The OCP monitors the channel pass current with VS and IS pins according to Ohm law. We hereby list the formulas for design OCP trigger point;

  1. Over-Current Protection design example:

  (1) Set $I_{ref} = 20\mu A$, so $R_I = \frac{V_{RI}}{I_{RI}} = \frac{1.27}{20\mu} = 63.5K(\Omega)$

  (2) Set R_{S12}=0.005Ω, $\Delta V_{12V} = 0.005 \times I_{+12V} = R_{OC12} \times 8 \times I_{ref}$

  (3) If +12V OCP trip point is 20A, $R_{OC12} = \frac{0.005 \times 20}{8 \times 20\mu} = 625(\Omega)$

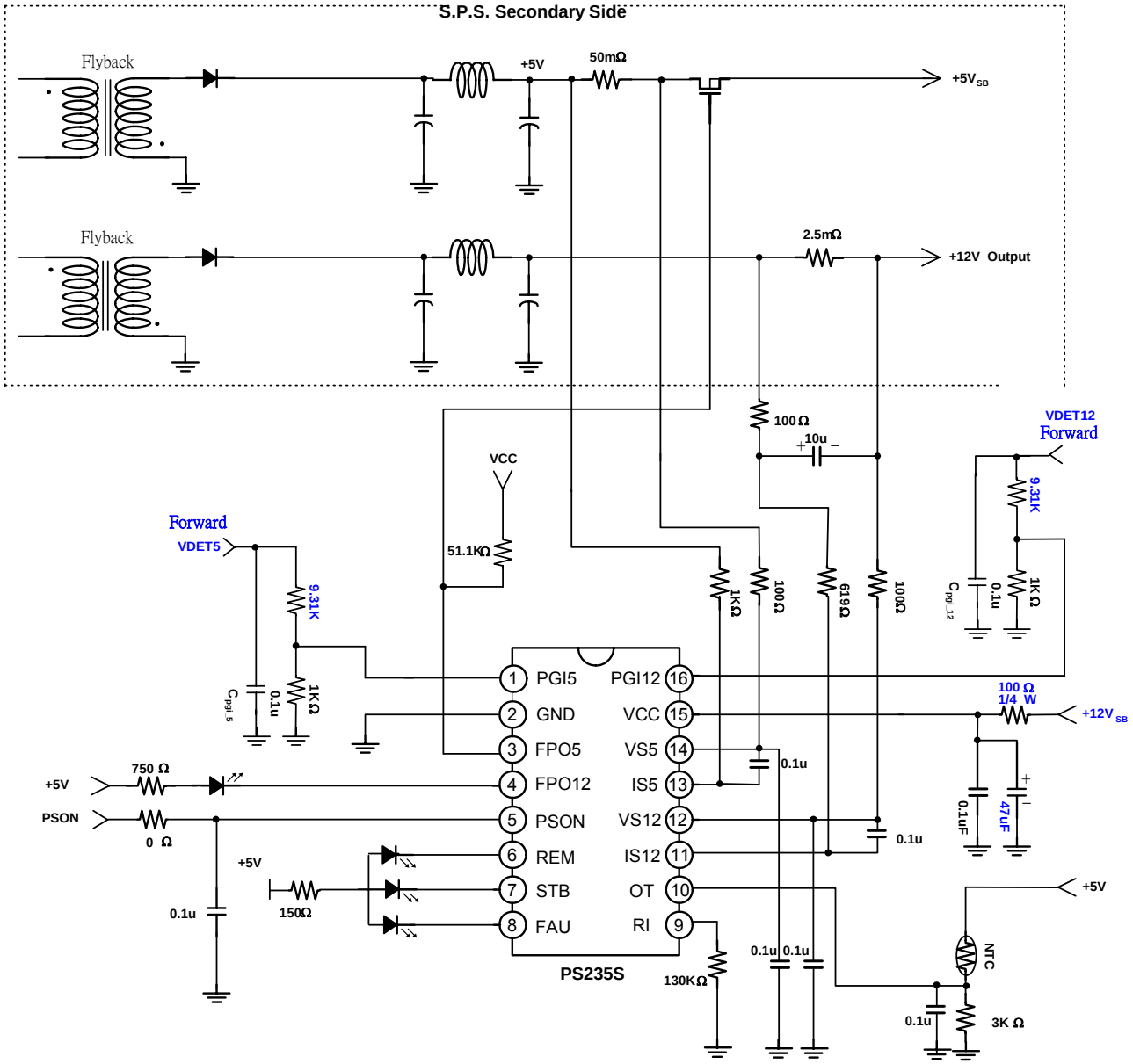
  2. It is recommended that R-C filters be connected to VS and IS pin, which increases the accuracy of OCP.

- GND path

  The GND path width should be made as wide as possible.

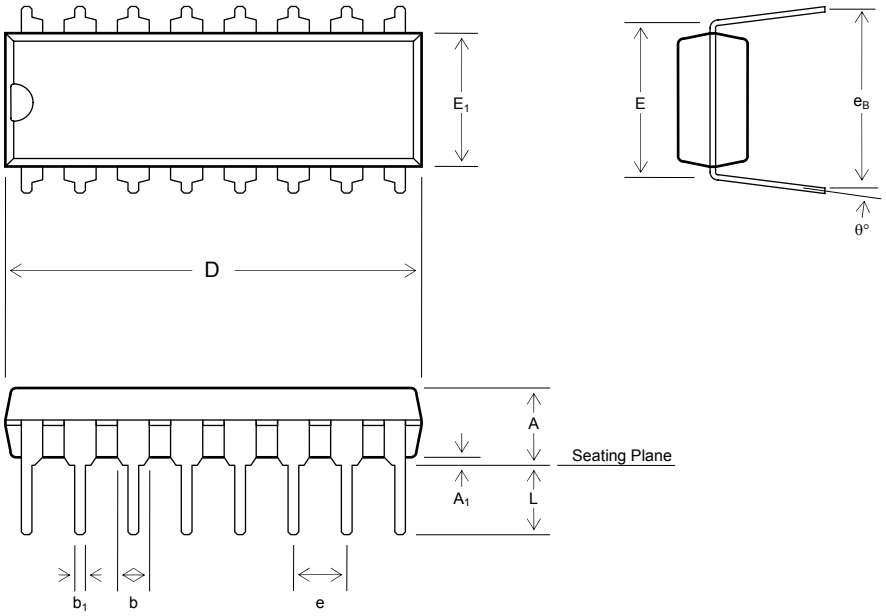
  The better grounding ability, the better performance during the surge test.

Application Circuit



Package Specification

(16-pin DIP)



Symbol	Dimension in mm			Dimension in inch			NOTE
	Min	Normal	Max	Min	Normal	Max	
A			5.33			0.210	
A_1	0.38			0.015			
e_B	7.29	8.41	9.53	0.287	0.331	0.375	
b		1.52			0.06		
b_1		0.46			0.018		
D	18.67	19.18	19.69	0.735	0.755	0.775	
E_1	6.01	6.30	6.55	0.238	0.248	0.258	
e	2.18	2.54	2.90	0.086	0.100	0.114	
E		7.62			0.3		
L	2.54	2.92	3.81	0.100	0.115	0.150	
θ°	0°	7°	15°	0°	7°	15°	

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