



SANYO Semiconductors

DATA SHEET

An ON Semiconductor Company

LV5636VH

Bi-CMOS Integrated Circuit
For BS/CS antennas
DC/DC converter

Overview

LV5636VH integrates 1ch DC/DC boost converter and 1ch LDO. It is suitable as the power supply for BS/CS antennas of LCD/PDP TV and BD recorders that require automatic recovery without IC destruction and malfunction when the output is short-circuited.

Functions

DC/DC boost converter

- Soft-start time: 2.6ms
- Pulse by pulse over-current limiter

LDO

- Over-current limiter (Fold back)

ALL

- Under-voltage lockout
- Power good
- Output voltage setting resistor

- Frequency 1MHz operation
- Short circuit protector (constant timer: 1.6ms)

- Thermal shut-down protector
- Power good delay function
- Output voltage switching function (BS/CS)

Specifications

Absolute Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
V _{CC} maximum supply voltage	V _{CC} max		-0.3 to 25	V
LDOIN maximum input voltage	V _{LDOIN} max		-0.3 to 30	V
SW maximum voltage	V _{SW} max		-0.3 to 30	V
Allowable power dissipation	P _d max	*1	1.45	W
Operating temperature	T _{opr}		-30 to 85	°C
Operating junction temperature	T _{jopr}		-30 to 125	°C
Storage temperature	T _{stg}		-40 to 150	°C

*1: When mounted on the specified printed circuit board (32.0mm × 38.0mm × 1.6mm), glass epoxy, double sides board

Caution 1) Absolute maximum ratings represent the value which cannot be exceeded for any length of time.

Caution 2) Even when the device is used within the range of absolute maximum ratings, as a result of continuous usage under high temperature, high current, high voltage, or drastic temperature change, the reliability of the IC may be degraded. Please contact us for the further details.

■ Any and all SANYO Semiconductor Co.,Ltd. products described or contained herein are, with regard to "standard application", intended for the use as general electronics equipment. The products mentioned herein shall not be intended for use for any "special application" (medical equipment whose purpose is to sustain life, aerospace instrument, nuclear control device, burning appliances, transportation machine, traffic signal system, safety equipment etc.) that shall require extremely high level of reliability and can directly threaten human lives in case of failure or malfunction of the product or may cause harm to human bodies, nor shall they grant any guarantee thereof. If you should intend to use our products for new introduction or other application different from current conditions on the usage of automotive device, communication device, office equipment, industrial equipment etc., please consult with us about usage condition (temperature, operation time etc.) prior to the intended use. If there is no consultation or inquiry before the intended use, our customer shall be solely responsible for the use.

■ Specifications of any and all SANYO Semiconductor Co.,Ltd. products described or contained herein stipulate the performance, characteristics, and functions of the described products in the independent state, and are not guarantees of the performance, characteristics, and functions of the described products as mounted in the customer's products or equipment. To verify symptoms and states that cannot be evaluated in an independent device, the customer should always evaluate and test devices mounted in the customer's products or equipment.

SANYO Semiconductor Co., Ltd.

<http://semicon.sanyo.com/en/network>

LV5636VH

Recommended Operating Conditions at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
V _{CC} supply voltage	V _{CC}		8 to 23	V
LDOIN input voltage	V _{LDOIN}		8 to 28	V
SW voltage	V _{SW}		-0.3 to 28	V
EN voltage	V _{EN}		0 to 23	V

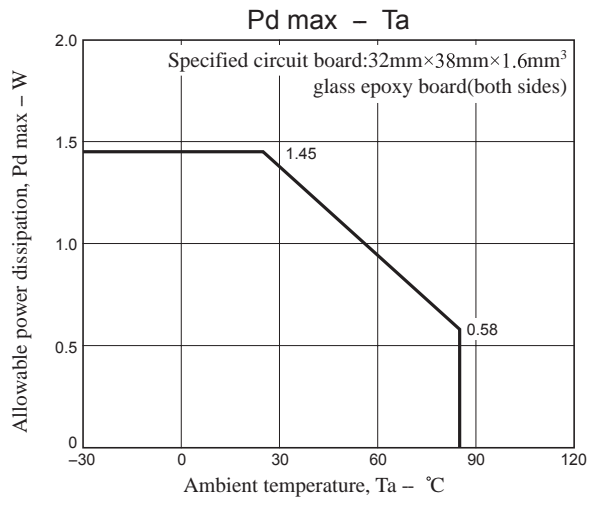
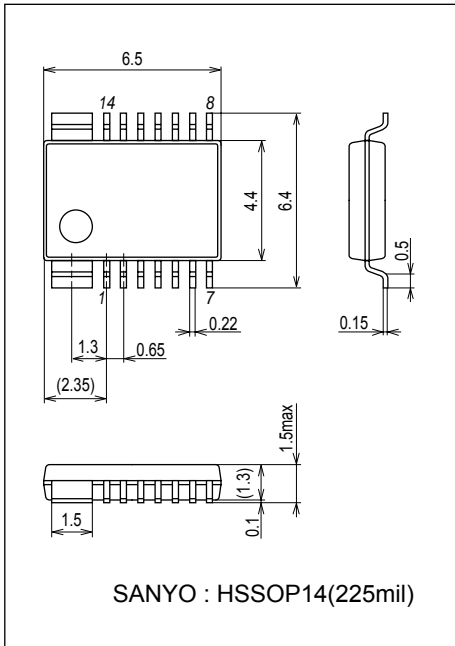
Electrical Characteristics at Ta = 25°C, V_{CC} = 12V, V_{EN}=V_{CTL}=2V

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
ALL						
Supply current	I _{CC}	Switching is turned off		2.1	4.0	mA
	I _{OFF}	EN=0V, LDOIN=0V			10	μA
Reference voltage	V _{REF}			1.26		V
LDO output voltage	LDOOUT1	CTL=High	(-2%)	15.9	(2%)	V
	LDOOUT2	CTL=Low	(-2%)	11.7	(2%)	V
DCDC output voltage	DCDCOUT1	CTL=High	(-2%)	16.5	(2%)	V
	DCDCOUT2	CTL=Low	(-2%)	12.3	(2%)	V
Enable voltage	V _{EN}		2.0			V
Disable voltage	V _{DIS}				0.4	V
EN input current	I _{EN}	V _{EN} =2.0V			10	μA
PGOOD threshold	V _{PG}	Power-good output is "good" when LDO is 85% or higher of the setting value.		85		%
PGOOD sink current	I _{PG}	Where power-good output is "no good" and V _{PGOOD} =0.5V.		1.0		mA
PGOOD leak current	I _{PGLK}	Where power-good output is "good" and V _{PGOOD} =2V			10	μA
PGDLY source current	I _{PGDLY}		3.84	4.8	5.76	μA
PGDLY threshold	V _{PGDLY}			1.26		V
CTL high voltage	V _{CTLH}	15V output setting	2.0			V
CTL low voltage	V _{CTLL}	11V output setting			0.4	V
CTL input current	I _{CTL}	V _{CTL} =2V			20	μA
UVLO on voltage	V _{UVLO}			7.0		V
Thermal shutdown temperature	TTSD	*2		155		°C
TSD hysteresis	THYS	*2		30		°C
DC/DC boost converter						
FB output voltage "Low"	FB low	I _N =2.0V, I _{FB} =-20μA (sink)			0.2	V
FB output voltage "High"	HB high	I _N =2.0V, I _{FB} =20μA (source)	1.8			V
Soft-start time	T _{SS}			2.6		ms
Oscillator frequency	f _{OSC}			1		MHz
Max ON duty	D max			85		%
SW ON resistance	R _{ON}			0.7		Ω
SW peak current	I _{PK}			1.8		A
SCP timer	t _{SCP}			1.6		ms
LDO						
Maximum output current	I _{O max}		450	620	800	mA
Line regulation	R _{LN}	16.5V < LDOIN < 21.5V			20	mV
Load regulation	R _{LD}	10mA < I _O < 300mA			50	mV
Dropout voltage	V _{DROP}	I _O =400mA		0.35	0.5	V
Short current	I _{SHORT}	LDOOUT=GND			100	mA

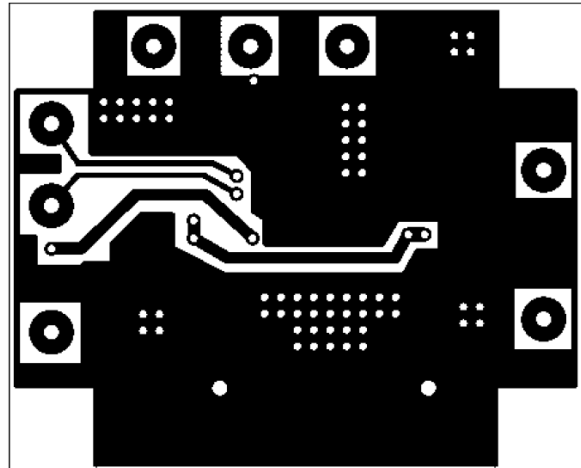
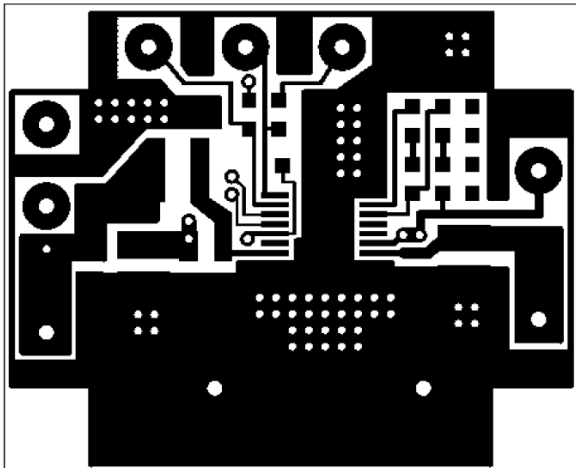
*2: Design guarantee value.

Package Dimensions

unit : mm (typ)
3313

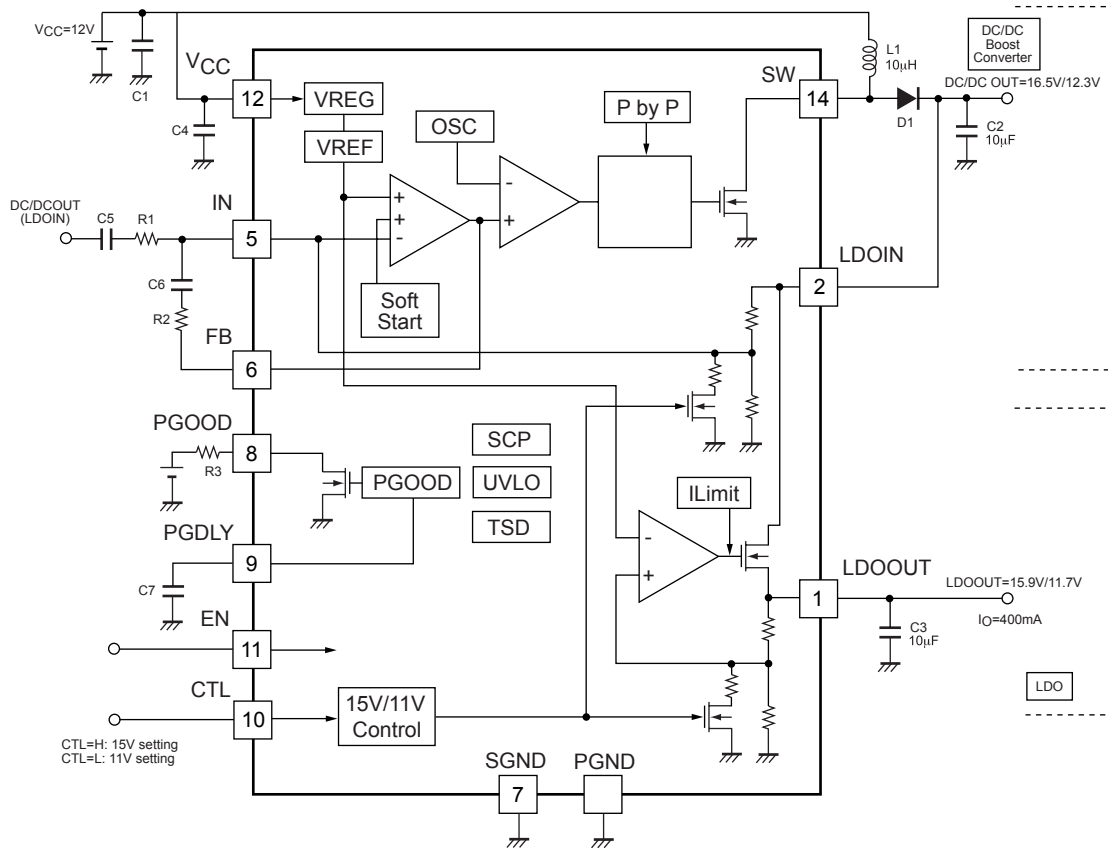


Specified board (32mm×38mm×1.6mm, glass epoxy, double side board)



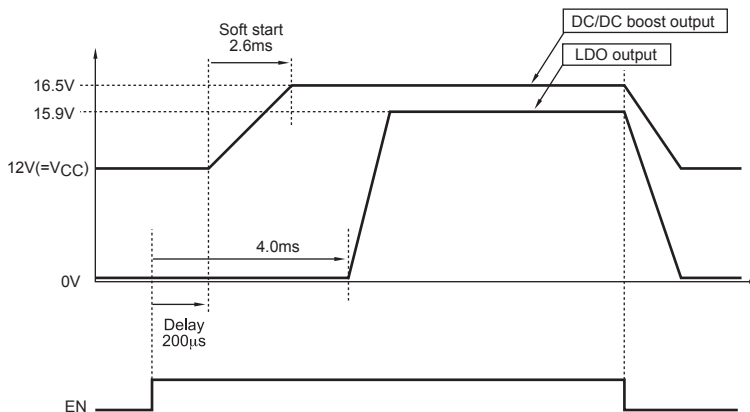
LV5636VH

Block diagram and Application circuit



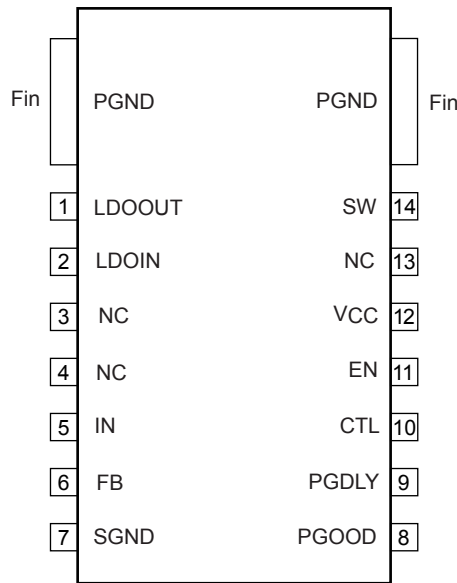
Start and stop

Output waveform during start and stop is shown below.



LV5636VH

Pin arrangement



Top view

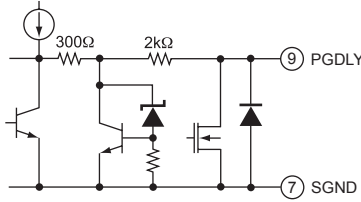
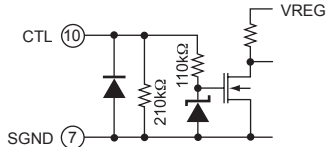
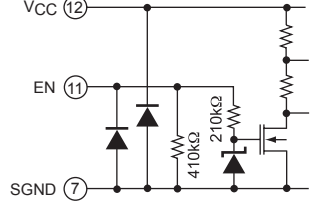
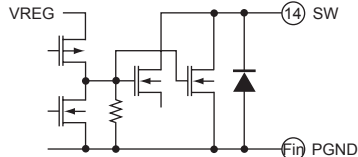
Pin function

Pin No.	Pin name	Function	Equivalent circuit
1 2 7	LDOOUT LDOIN SGND	LDO output LDO input Signal ground	
5	IN	DC/DC error amplifier input	
6	FB	DC/DC error amplifier output	
8	PGOOD	Power good output	

Continued on next page.

LV5636VH

Continued from preceding page.

Pin No.	Pin name	Function	Equivalent circuit
9	PGDLY	PGDLY capacitor connection pin for delay time setting	
10	CTL	15V, 11V output voltage switching	
11 12	EN VCC	Enable Power supply	
14 Fin	SW PGND	DC/DC open drain output Power ground	

Function overview

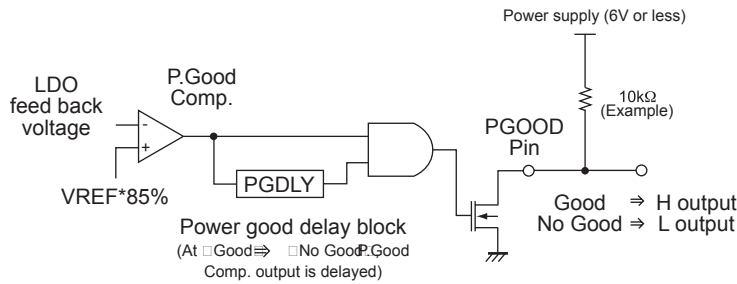
(1) UVLO (Under Voltage Lockout)

UVLO stops outputs of both DC/DC and to LDO to prevent malfunction when V_{CC} decreases. UVLO operates when V_{CC} falls below the UVLO voltage. This function is a non-latch-type, and recovers these outputs automatically when V_{CC} exceeds the UVLO voltage.

(2) Power good

Power good notifies that the output voltage of LDO is within the range of the setting voltage. The output is judged to be "power good" when both outputs are 85% or higher compared to the setting voltages. If the output voltage falls below 85%, PGOOD output becomes H→L (No Good). At "Good"→"No Good", delay time can be set. It explains this at (3). When EN=L (OFF), PGOOD output is H.

[Power good circuit diagram]

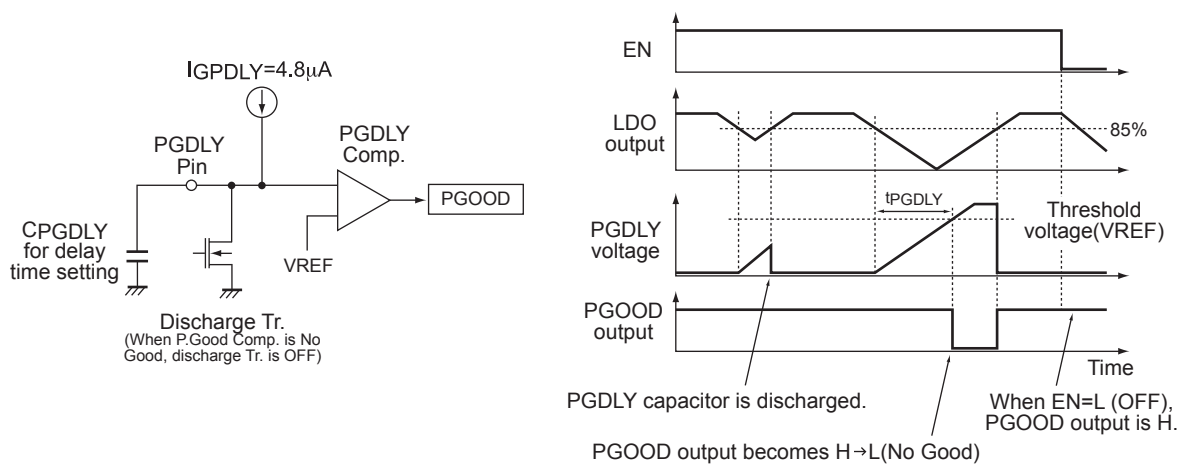


(3) Power good delay

If the output voltage of LDO falls below 85%, charge at $4.8\mu\text{A}$ constant starts to PGDLY capacitor for delay time setting. When PGDLY voltage exceeds the threshold voltage (=VREF), PGOOD voltage reaches to the threshold voltage, PGDLY capacitor using the following formula because delay time (t_{PGDLY}) depends on capacitance.

$$C_{PGDLY} = (I_{PGDLY} \times t_{PGDLY}) / V_{REF}$$

[PGDLY circuit diagram]

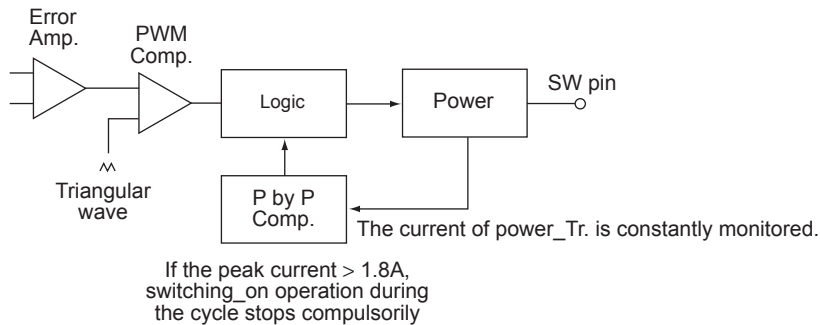


LV5636VH

(4) Pulse-by-Pulse over current protection (P by P)

The P by P stops switch-on operation of a certain cycle by force when the current of power MOSFET reaches the maximum output peak current.

[P by P circuit diagram]



(5) Short circuit protector (SCP)

When output voltage of DC/DC decreases due to short-circuit; for example, SCP latches off the outputs of DC/DC and LDO by timer.

When output voltage of DC/DC decreases and FB that is the error amplifier output turns to H, the internal counter starts, latch-off occurs after 1.6ms.

To restart the output after latch-off, you need to input EN signal again.

(6) Output voltage switching function

Where CTL=High, 15V output setting is selected.

Where CTL=Low, 11V output setting is selected.

- SANYO Semiconductor Co.,Ltd. assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all SANYO Semiconductor Co.,Ltd. products described or contained herein.
- SANYO Semiconductor Co.,Ltd. strives to supply high-quality high-reliability products, however, any and all semiconductor products fail or malfunction with some probability. It is possible that these probabilistic failures or malfunction could give rise to accidents or events that could endanger human lives, trouble that could give rise to smoke or fire, or accidents that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design, and structural design.
- In the event that any or all SANYO Semiconductor Co.,Ltd. products described or contained herein are controlled under any of applicable local export control laws and regulations, such products may require the export license from the authorities concerned in accordance with the above law.
- No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or any information storage or retrieval system, or otherwise, without the prior written consent of SANYO Semiconductor Co.,Ltd.
- Any and all information described or contained herein are subject to change without notice due to product/technology improvement, etc. When designing equipment, refer to the "Delivery Specification" for the SANYO Semiconductor Co.,Ltd. product that you intend to use.
- Upon using the technical information or products described herein, neither warranty nor license shall be granted with regard to intellectual property rights or any other rights of SANYO Semiconductor Co.,Ltd. or any third party. SANYO Semiconductor Co.,Ltd. shall not be liable for any claim or suits with regard to a third party's intellectual property rights which has resulted from the use of the technical information and products mentioned above.

This catalog provides information as of September, 2011. Specifications and information herein are subject to change without notice.