500mA Dual Linear Regulator with V_{AUX} Driver

FEATURES

- Continuous 3.3V output from three inputs
- Complete power management solution
- V_{CC}, V_{SBY} regulator supplies 500mA output
- Built-in hysteresis when selecting input supplies
- Drive control signal for external V_{AUX} switch
- Output can be forced higher than input (off-state)

APPLICATIONS

- Desktop Computers
- PCI Adapter Cards with Wake-on-LAN
- Network Interface Cards (NICs)
- Multi-power Systems
- Systems with Standby Capabilities

DESCRIPTION

The SS6532 is a dual-input regulator with V_{AUX} drive control capable of delivering 3.3V/500mA continuously. The output power is provided from three independent input voltage sources on a prioritized basis. Power is always taken in priority using the following order: V_{CC}, V_{SBY}, and V_{AUX}.

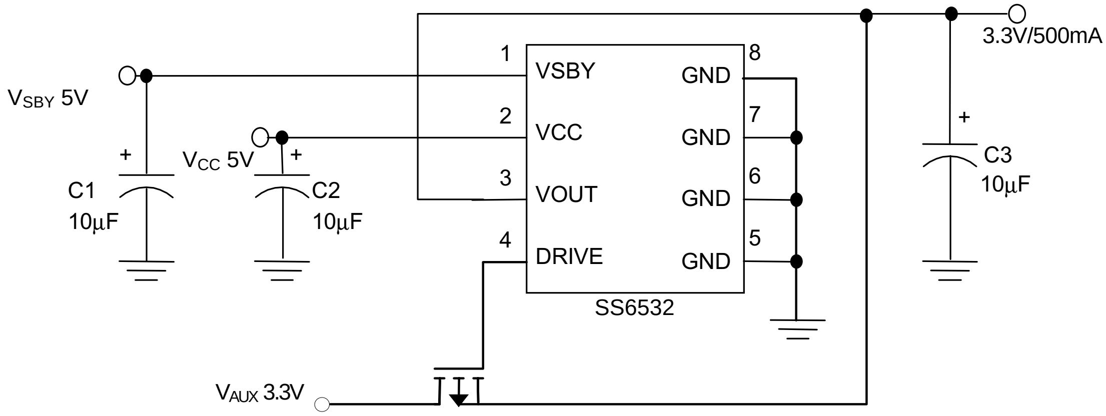
The SS6532 meets Intel's "Instantly Available" power requirements which follow the ACPI "Advanced Configuration and Power Interface" standards.

When either V_{CC} or V_{SBY} is present, the device automatically enables the regulator and produces a stable 3.3V output. When only V_{AUX} (3.3V) is present, the drive control output will turn on an external P-MOSFET switch from an auxiliary 3.3V supply V_{AUX} to maintain V_{OUT}.

The IC also prevents excessive current from flowing back from V_{OUT} to either input or ground when the output voltage is greater than the input voltage.

All the control circuitry needed to provide a a smooth and automatic transition between all three supplies has been incorporated. This allows both VCC and VSBY to be dynamically switched without loss of output voltage.

TYPICAL APPLICATION CIRCUIT



Dual-input Regulator with Auxiliary Driver

ORDERING INFORMATION

SS6532CXXX

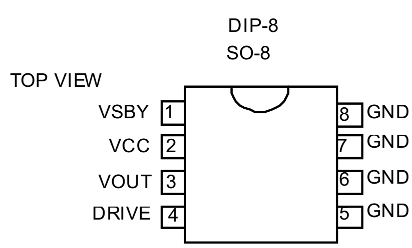
- Packing type
  - TR: Tape and reel
  - TB: Tubes
- Package type
  - N: PDIP-8
  - S: Small outline

Example: SS6532CSTR

→ in SO-8 package on tape and reel.

(CN/PDIP-8 is only available in tubes)

PIN CONFIGURATION



ABSOLUTE MAXIMUM RATINGS

V_{CC}, V_{SBY} Input Voltage	7.0V
V_{AUX} Input Voltage	4.0V
V_{OUT} Output Voltage	5.0V
Operating Temperature Range	-40°C~85°C
Storage Temperature Range	-65°C ~ 150°C

ELECTRICAL CHARACTERISTICS (V_{IN}=5V, T_A=25°C, unless otherwise specified)

PARAMETERS	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Regulated Output Voltage	0mA < I_{LOAD} < 500mA	3.135	3.300	3.465	V
Regulated Output Current		500			mA
Output Voltage Load Regulation	V_{CC} selected I_{LOAD}=50mA ~ 500mA V_{SBY} selected I_{LOAD}=50mA ~ 500mA		20 20		mV
Output Voltage Line Regulation	V_{CC}=4.5V~5.5V, I_{LOAD}=5mA V_{SBY}=4.5V~5.5V, I_{LOAD}=5mA		2		mV
VCC Select Voltage VCC Deselect Voltage	V_{SBY} > V_{SBYDES} or V_{AUX} present V_{CC} < V_{CCDES}	 3.90	4.50 4.20	4.60	V
V_{SBY} Select Voltage V_{SBY} Deselect Voltage	V_{AUX} present V_{SBY}< V_{SBYDES}	 3.90	4.50 4.20	4.60	V
Hysteresis Voltage			0.30		V
Short Circuit Current	$V_{CC/SBY}$=5V, V_{OUT}=0V		1000		mA
V_{CC} Pin Reverse Leakage V_{SBY} Pin Reverse Leakage	V_{CC} = 0V , V_{SBY} = 5V V_{CC} = 5V , V_{SBY} = 0V		5 5	50 50	µA
Ground Current	$V_{CC/SBY}$=5V , I_{LOAD} = 0mA $V_{CC/SBY}$=5V , I_{LOAD} = 500mA		100 100	500 500	µA
Short Circuit Current	$V_{CC/SBY}$=5V, V_{OUT}=0V		1000		mA
V_{DRIVE} High Voltage	V_{CC} or V_{SBY} selected	3.75	4.00		V
Drive delay	Drive High Delay Drive Low Delay		5.0 0.5		µs
Drive Pin Current limit	V_{DRIVE}=1V,V_{CC}=5V	0.5	6.0	25.0	mA

TYPICAL PERFORMANCE CHARACTERISTICS

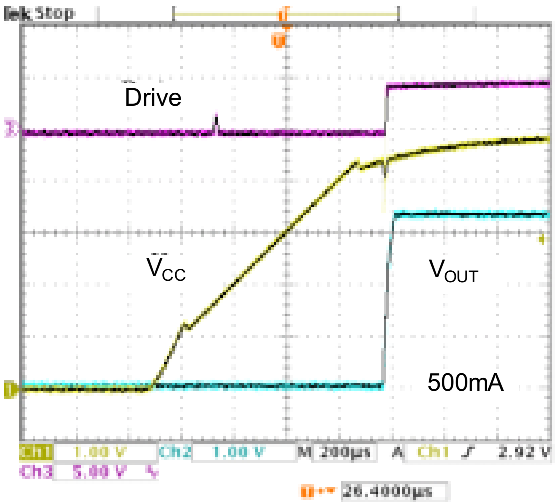


Fig. 1 V_{CC} Cold Start

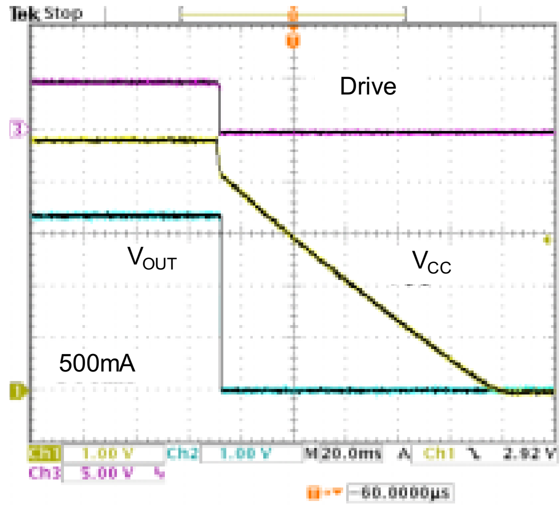


Fig. 2 V_{CC} Full Power Down

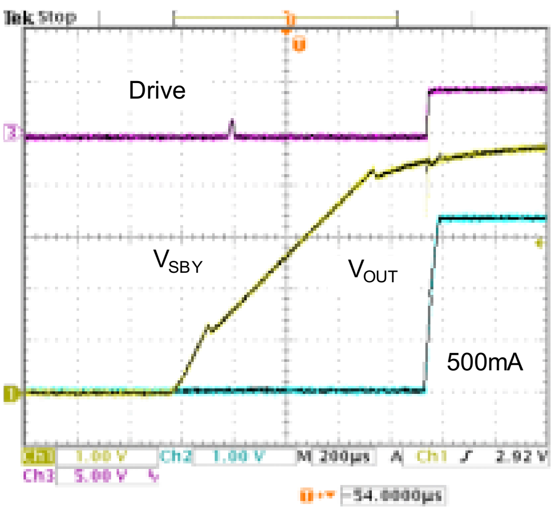


Fig. 3 V_{SBY} Cold Start

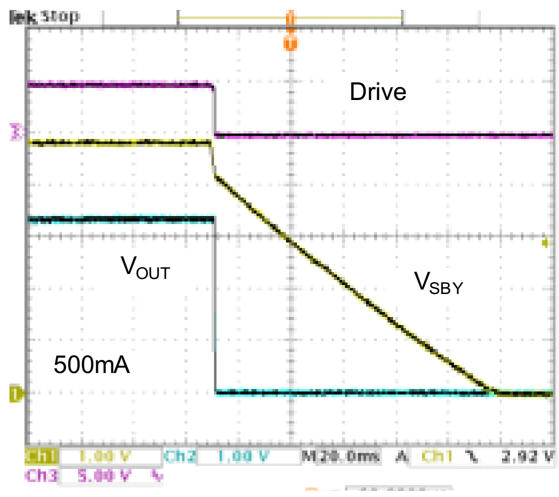


Fig. 4 V_{SBY} full power down

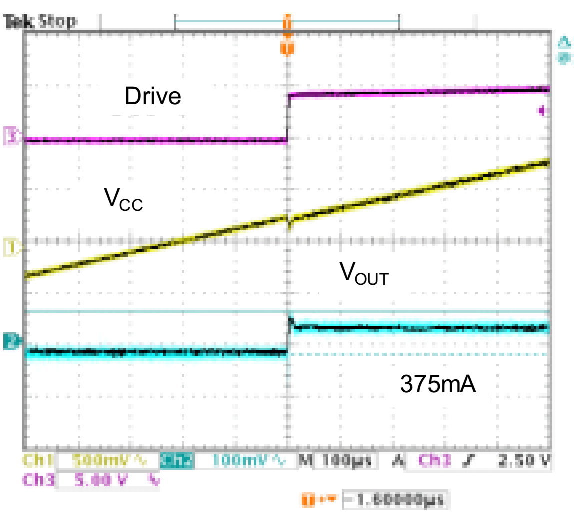


Fig. 5 V_{CC} Power-Up

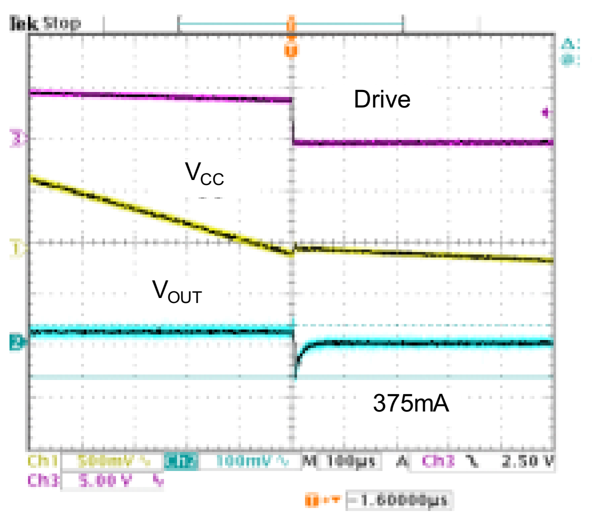


Fig. 6 V_{CC} power-down

TYPICAL PERFORMANCE CHARACTERISTICS (contd.)

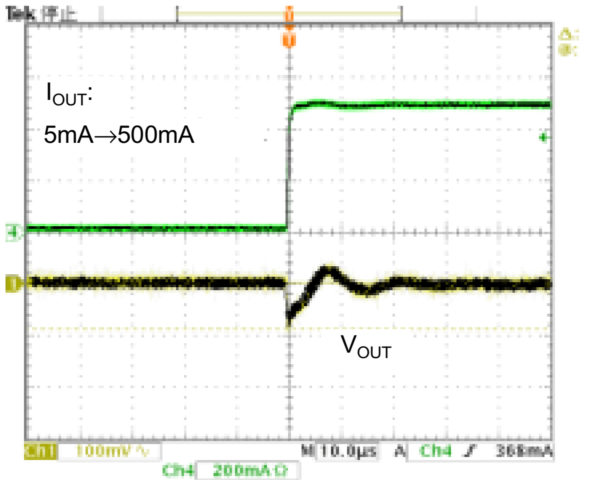


Fig. 7 V_{CC} Load Transient Rising

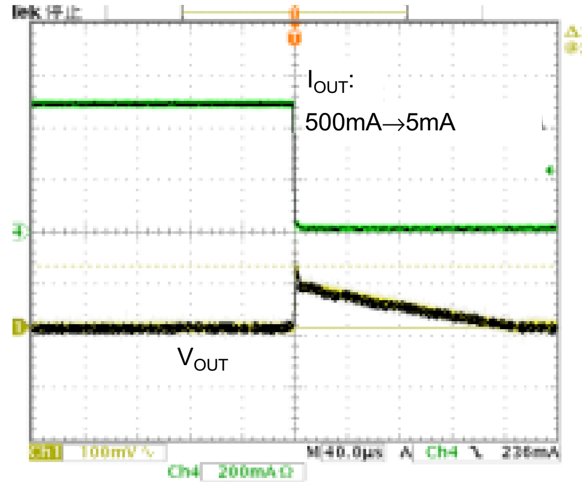


Fig. 8 V_{CC} Load Transient Falling

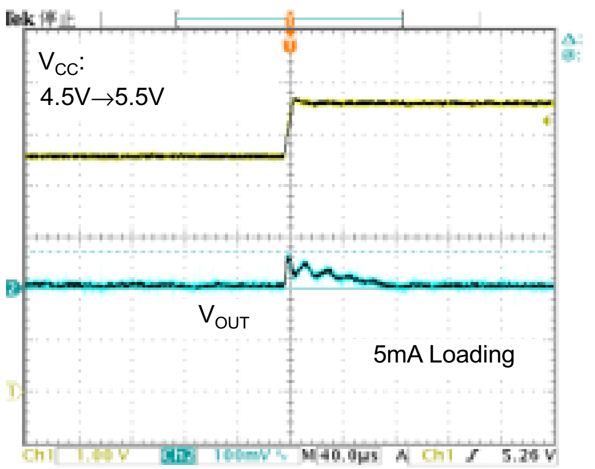


Fig. 9 V_{CC} Line Transient Rising

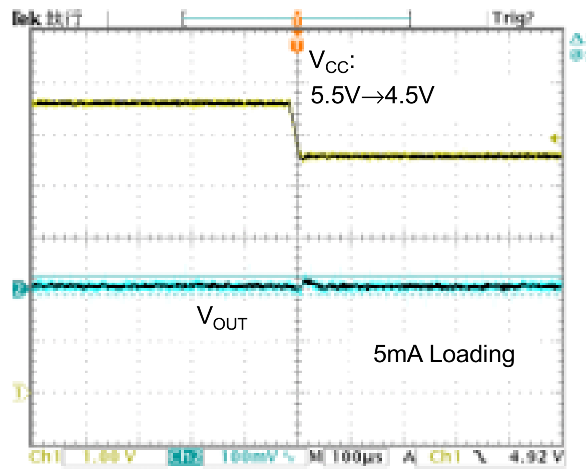


Fig. 10 V_{CC} Line Transient Falling

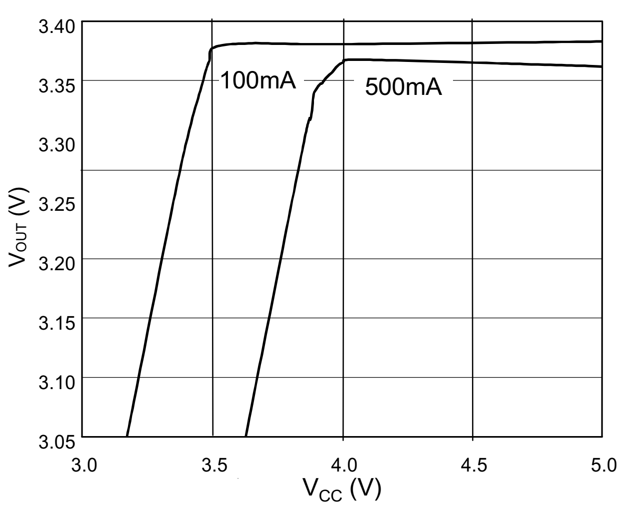


Fig. 11 V_{CC} Line Regulation

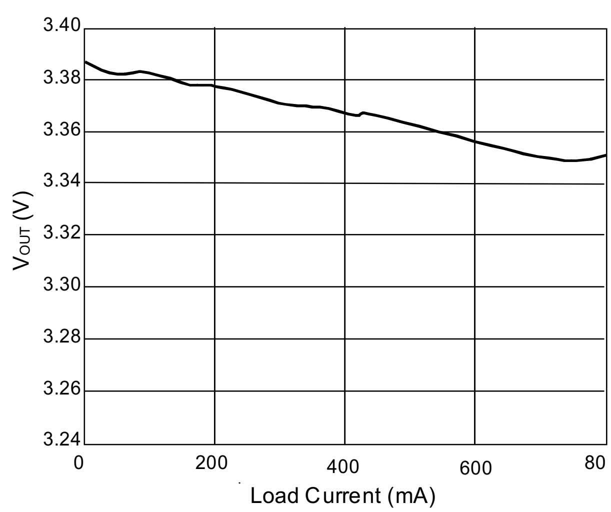


Fig. 10 V_{CC} Load Regulation

TYPICAL PERFORMANCE CHARACTERISTICS (contd.)

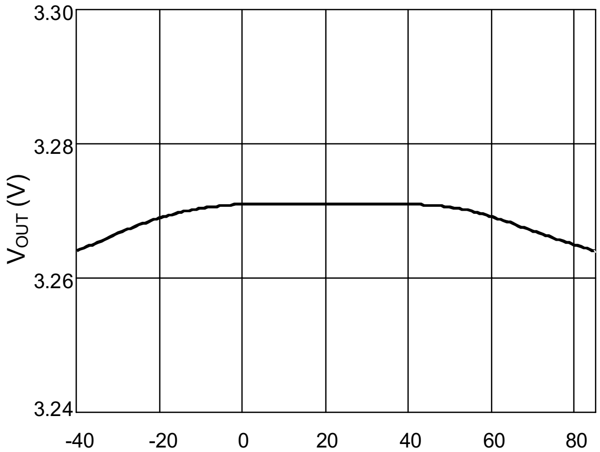
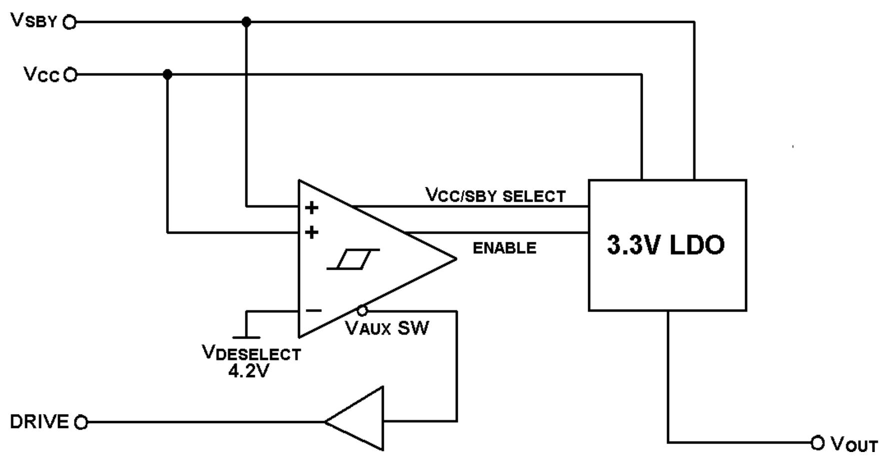


Fig. 13 Output Voltage vs. Temperature

BLOCK DIAGRAM



PIN DESCRIPTION

PIN 1: VSBY - Standby supply voltage (5V) input for 3.3V regulator when VCC falls below V_{CCDES}. Some NICs that operate in " Wake-On-LAN" mode get a 5V standby through a cable that connects directly to a specific header on the Motherboard.

PIN 2: VCC - Primary supply voltage (5V) input for 3.3V regulator.

PIN 3: VOUT - 3.3V regulated output voltage when either V_{CC} or V_{SBY} is present. When only V_{AUX} (3.3V) is present, V_{OUT} voltage comes from V_{AUX} through an internal low impedance switch.

PIN 4: DRIVE - Signal for controlling external auxiliary switch. Active Low when internal regulator is disabled .

PIN 5-8: GND - Negative reference for all voltages.

APPLICATIONS INFORMATION

The Requirement for External Capacitors

The selection of the output capacitor is based on two requirements: LDO compensation and the transition between power sources. During the takeover between sources, the output capacitor provides the loading. Therefore a larger output capacitor can improve the transition. And since the output capacitor plays the important role in the compensation of LDO, a 10μF Tantalum capacitor or larger is recommended.

The input capacitor is required to be as close to the IC as possible. The input capacitor can reduce the parasitic effect formed by the power supply output impedance or the trace. A 10μF Tantalum capacitor is a good choice. Additional ceramic capacitor can be placed close to input and output to reduce the high frequency noise. A 0.1μF is recommended.

The layout and Thermal Considerations

The SS6532 is housed in a thermally enhanced package where the GND pins (Pin5 to Pin8) are integrated to the leadframe. Generally, heat sinks are not available for most surface-mounted devices. Instead, they rely on the printed-circuit board to provide the thermal path. When the SS6532 operates normally, the maximum power dissipation is

$$P_D = (V_{IN} - V_{OUT}) \times I_{OUT} = (5 - 3.3) \times 0.5 = 0.85W$$

At the maximum operation temperature, the thermal resistance seen by the device, or the combination of all the thermal paths, should be

$$R_{JA} \langle \frac{165 - 85}{0.85} = 94°C/W .$$

When the device is mounted on a double-sided printed circuit board, the ground plane is the most used thermal path. To make sure the thermal resistance small enough and the shutdown function work normally, the thermal resistance between GND pins to GND plane should be as small as possible by means of adding more vias. And the GND plane should be at least 1 square centimeters of copper.

The layout of the SS6532 is shown in fig.19. In Fig. 21, the thermal resistance R_{JA} is 70.36°C/W where the SS6532 is mounted on the double-sided PCB and measured under forced-air thermal chamber.

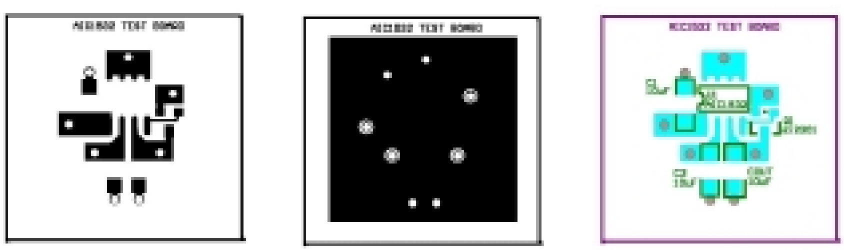


Fig.19 The layout for the SS6532.

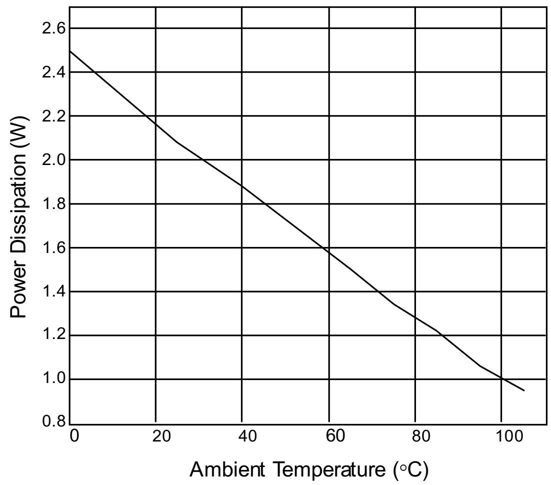


Fig.20 The thermal shutdown power dissipation vs. ambient temperature where R_{JA} is 70.36°C/W in the forced-air thermal chamber

Application circuits

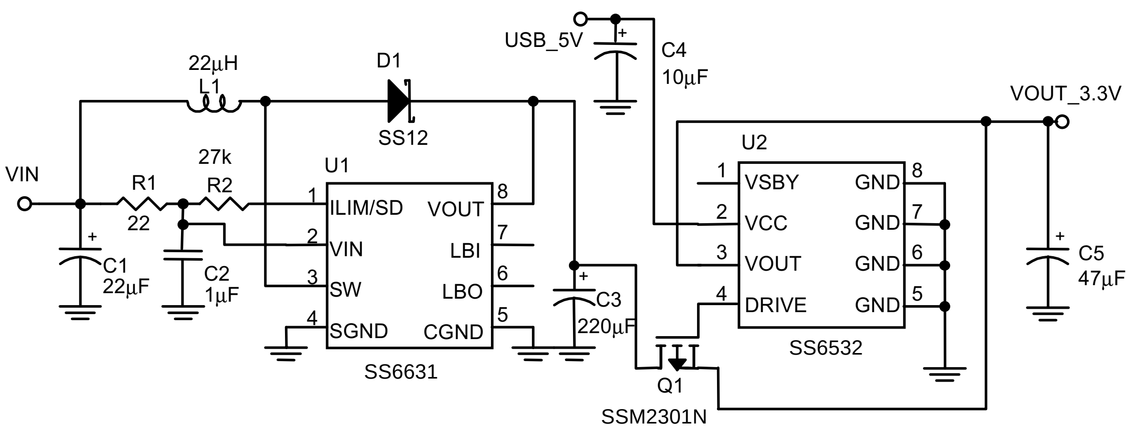


Fig. 21 The Step Up converter with OR function for dual power system

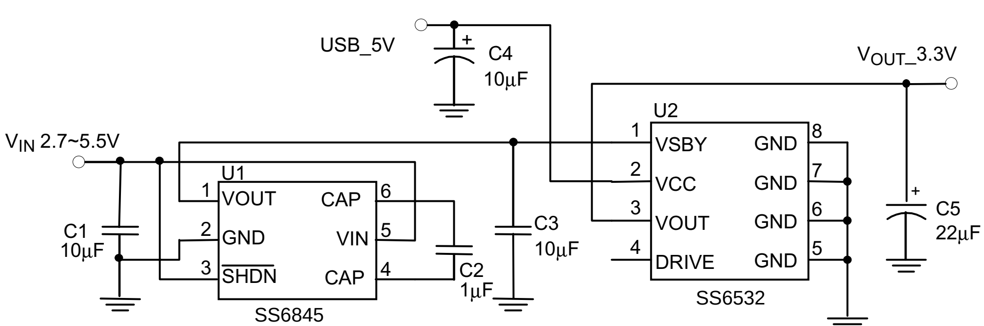
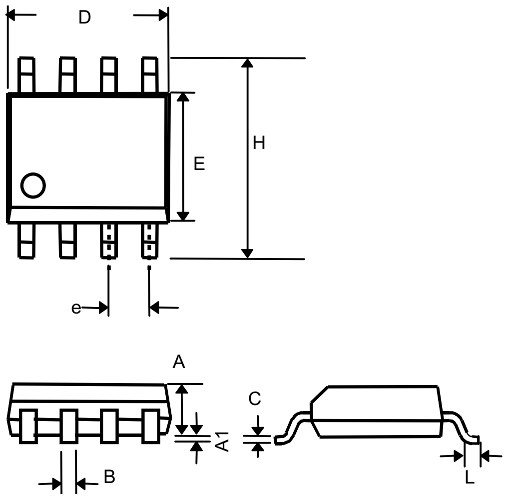


Fig. 22 The Step Up/Down converter with OR function for dual power system

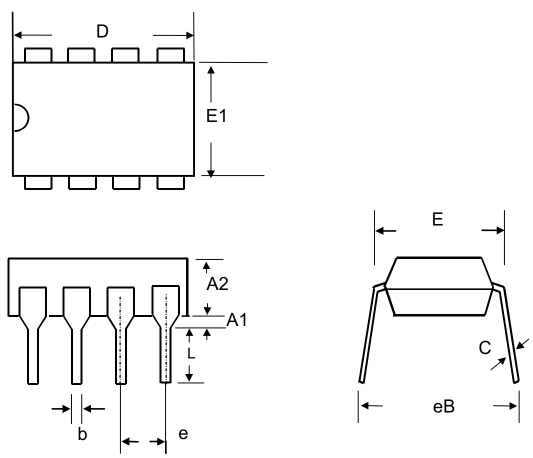
PHYSICAL DIMENSIONS

8-LEAD PLASTIC SO (units: mm)



SYMBOL	MIN	MAX
A	1.35	1.75
A1	0.10	0.25
B	0.33	0.51
C	0.19	0.25
D	4.80	5.00
E	3.80	4.00
e	1.27(TYP)	
H	5.80	6.20
L	0.40	1.27

8-LEAD PLASTIC DIP (units: mm)



SYMBOL	MIN	MAX
A1	0.381	—
A2	2.92	4.96
b	0.35	0.56
C	0.20	0.36
D	9.01	10.16
E	7.62	8.26
E1	6.09	7.12
e	2.54 (TYP)	
eB	—	10.92
L	2.92	3.81