Synchronous Rectifier Power Switch IC

1. Feature

Built-in TrueWave™ real time waveform tracking technology

Built-in DSSS™ dynamic adaptive power supply technology

Without the auxiliary winding is supported

CCM/CrM/DCM mode of switching power supported

Built-in NMOSFET BVdss voltage up to 105 V

Built-in Low RdsON NMOSFET :

LN5S100D10: 10 mΩ, at output 3A current condition, equivalent to VF=0.03 V

LN5S100D08: 8 mΩ, at output 4A current condition, equivalent to VF=0.03 V

LN5S100D06: 6 mΩ, at output 5A current condition, equivalent to VF=0.03 V

LN5S100D04: 4 mΩ, at output 6A current condition, equivalent to VF=0.03 V

Construction of ideal diode applications for 0V~25 V 2~6 A Output system

The efficiency is increased by 4~10 % compared with the traditional diode rectifier

Simple to require only one external capacitor

PDPAK8 package with enhanced heat dissipation

2. Applications

QC / PD Quick Charger

High efficiency USB Charger

High efficiency Power Adapter

Replace low-VF rectifier diodes

3. Description

LN5S100Dxx is a high performance switching power secondary side synchronous rectifier IC with MOSFET build-in. It can easily build up a low voltage and high current switching power supply system with energy efficiency standard of CoC V5 level and DoE level VI. A unique TrueWave™ real time waveform tracking technology built-in on this chip, it can also support up to 150 kHz frequency application and various operating modes of switching power supplies such as CCM/CrM/DCM.

The low RdsON MOSFET inside the device could be turn on or off on the edge of each conversion waveform of the switching power supply. Very low turn-on voltage drop can get the far less conduction loss compared with the Schott Diode's. It will greatly improve the conversion efficiency of the system and reduce the temperature of rectifier device so a high conversion efficiency of low voltage and high current switching power supply system could be achieved conveniently.

The NMOSFET synchronous rectifier power switch BVdss voltage up to 105 V has a very low RdsON. typical value of RdsON could be less than 4 mΩ so as to the system can provide up to 6 A output current. The forward-flyback power could be obtained by the controller directly from transformer terminal for power supply operation. In a simple way, a better

conduction performance is obtained and the very low output voltage is available.

Benefit from the adaptive power supply design, the system can work on the positive or negative side of the output side and only requires one capacitor.

Now halogen-free PDPAK8 (PDFN5*6) standard green package is available.

4. Functional Block Diagram

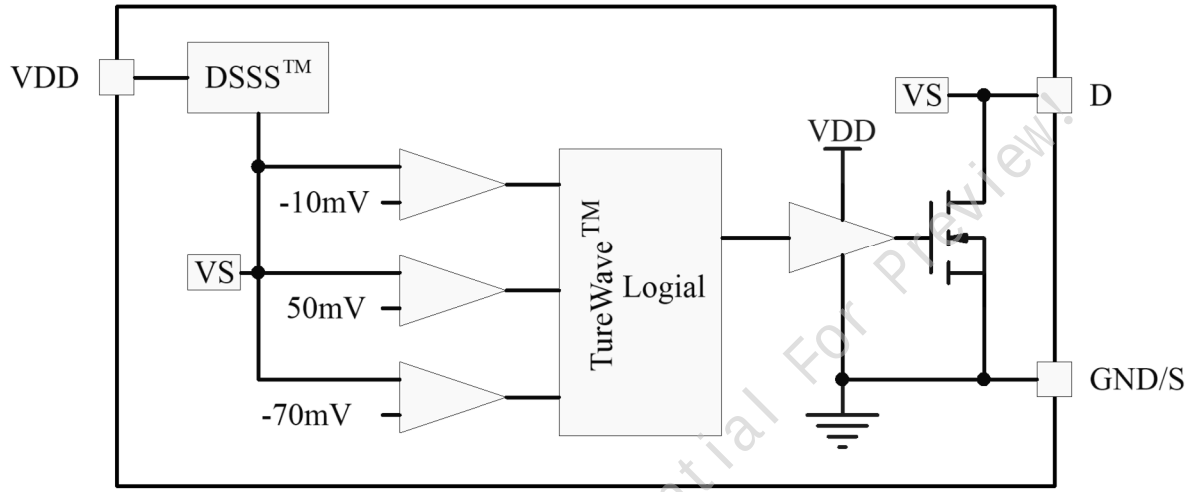


Fig1. Internal functional block diagram

5. Pin Definitions

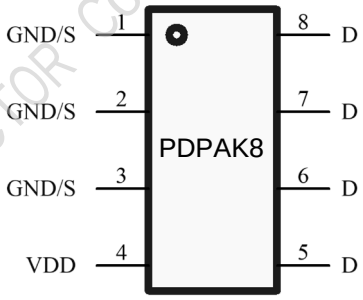


Fig2. Pin Definitions

6. Pin Function Description

PIN	Symbol	Function
1/2/3	GND/S	Ground and internal MOSFET source pin
4	VDD	Power supply pin, Connect the capacitor to GND/S
5,6,7,8	D	Switch pin, MOSFET drain

7. Typical Simplified Schematic

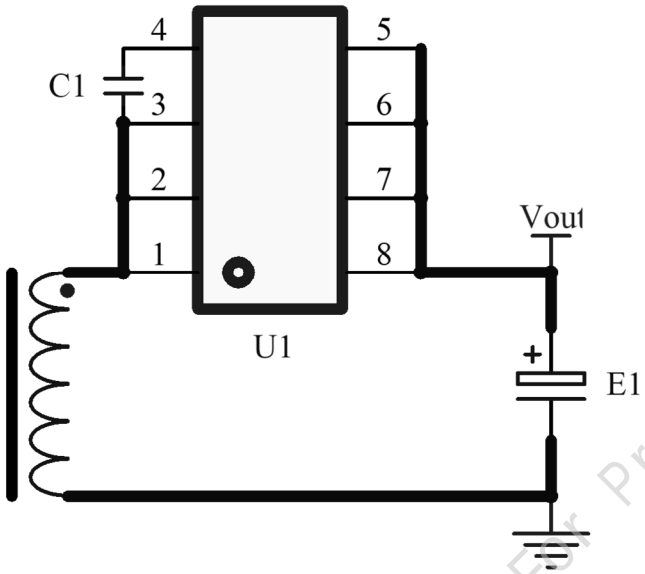


Fig3a. Typical Simplified Schematic for high side application

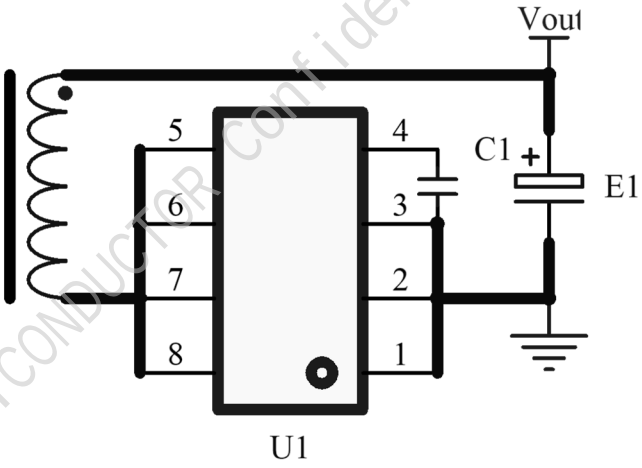


Fig3b. Typical Simplified Schematic for low side application

8. Absolute Maximum Ratings *

Item		Parameter	unit
D pin input Voltage		-1~+105 **	V
D pin input current		+50/+30/+20/+20 to -1 ***	A
D pin Pulse current capability		140 ****	A
VDD pin input voltage		-0.3~+12 *****	V
Allowable dissipation power of PD		1000	mW
Min/Max Operating Junction Temperature T_J		-40 to +150	℃
Min/Max Operating Ambient Temperature Ta		-20 to +105	℃
Min/Max Storage Temperature Tstg		-55 to +150	℃
ESD	HBM	2500	V
	MM	250	V

Note*: Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute maximum-rated conditions for ex tended periods may affect device reliability.** : with 1 mA limit. *** : For D04/D06/D08/D10, For test, Pulse width is 1 ms and cycle is 1 S. **** : For test, Pulse width is 300us and Duty is 0.5 %. ***** : with 5 mA limit.

9. Recommended Operating Conditions

Symbol	Parameter	Min	Type	Max	Unit
V_{DD}	VDD supply Voltage	4.3		12	V
V_{DS}	VS peak voltage			100	V
TA	Operating ambient temperature	-20		85	℃

10. Electrical Characteristics (Ta = 25℃, VDD=6.5V, if not otherwise noted)

Power Supply Voltage (VDD Pin)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
VDD_{ON}	VDD Start-up Voltage	VDD from 0V to 7V	-	4.3	-	V
VDD_{OFF}	VDD Shut-down Voltage	VDD from 7V to 0V	-	4.0	-	V
VDD_{HYT}	UVLO Hysteresis Voltage		-	0.3	-	V
I_{VDD}	VDD Standby Current	GATE=OPEN,VS=6V	-	0.2	-	mA
I_{VDD2}	VDD Operating Current	GATE=2nF,VS=50kHz	-	2.5	-	mA
I_{VDDCHG}	VDD Charge Current		10	-	200	mA
I_{VDDC}	VDD Current Limit		-	30	-	mA

Switch output section (D Pin)

Symbol	Parameter	Test Conditions	Min	Type	Max	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	ID=100 uA	105	-	-	V
$R_{DS}ON$	RdsON of power switch	LN5S100D10, I_{DS}=5A		10	12	mΩ
		LN5S100D08, I_{DS}=5A		8	9.6	mΩ
		LN5S100D06, I_{DS}=5A		6	7.2	mΩ
		LN5S100D04, I_{DS}=5A		4	5	mΩ
T_r	Output rising time	-0.5->5 V, I_{DS}=5A	-	10	-	nS
T_f	Output falling time	5V->-0.5 V, I_{DS}=5A	-	10	-	nS

Wave sampling section (internal VS Pad)

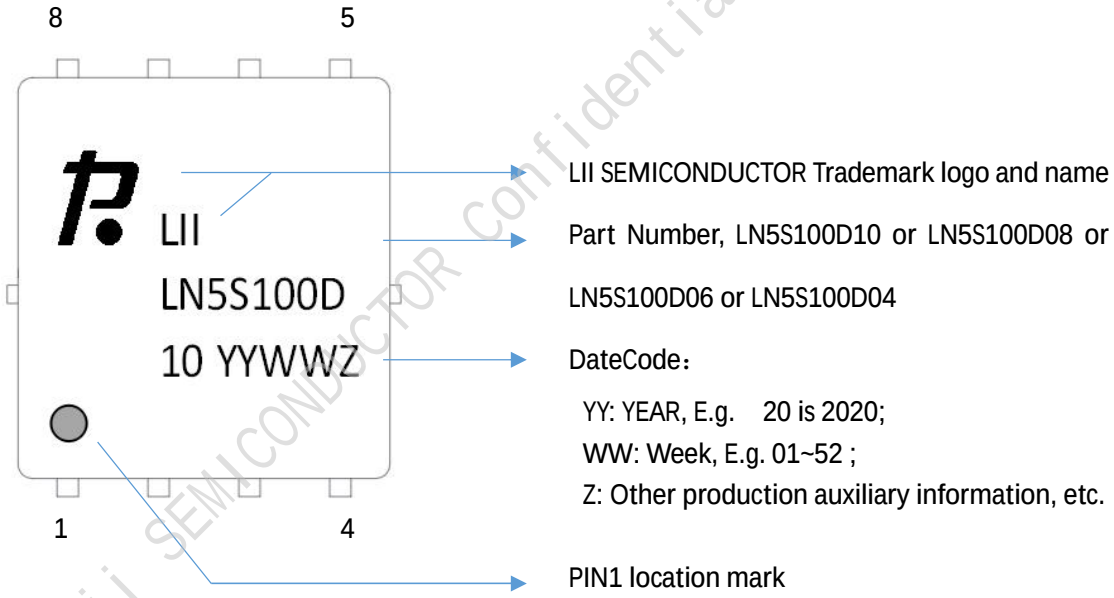
Symbol	Parameter	Test Conditions	Min	Type	Max	Unit
V_{STHON}	VS Threshold voltage for turn on		-	-200	-300	mV
V_{STHOFF}	VS Threshold voltage for turn off		-	-5	-	mV
VS_{KPON}	VS Turn-on keep Voltage		-	-60	-100	mV
V_{STHONS}	VS Threshold voltage for reset		-	50	100	mV
T_{HOLD}	VS blanking hold time		-	1.5	-	us

Thermal Data

Symbol	Parameter	Rating	Unit
θ_{JA}[1]	Thermal Resistance Junction-Ambient	40	℃/W
θ_{JC}[2]	Thermal Resistance Junction-Case	2	℃/W

Notes: 1. All leads are soldered on a 250mm^2 copper foil with 2oz thick to measuring. 2. Measured on the surface of the package near pin 5/6/7/8.

11. Marking Information



Note: The picture is an example for Part Number. The actual marked part number correspond to their respective products.

12. Application and Implementation

LN5S100Dxx is a high performance synchronous rectifier controller IC with 105V 10/8/6/4 mΩ MOSFET built-in. It is designed for high efficiency switching power converters. This chip can work in a variety of power systems mode including CCM/CrM/DCM/QR etc. so it can easily launch the low voltage and high current output system to meet the requirements of the high level international energy efficiency standards such as CoC V5 & DoE level VI and so on.

12.1 VDD supply

After the system is powered on, the internal circuit charges VDD through the VS terminal. When the VDD voltage reaches the starting voltage, the system circuit starts to initialize, establishes the internal reference voltage and reference current, and starts to enter the working state. The VDD voltage will be automatically maintained during system operation Within the scope of the design, and has the function of automatic adjustment and control, in the application, only a necessary decoupling capacitor needs to be connected to the VDD pin to meet the needs of the system. Under general conditions, it is recommended to use an external VDD capacitor of no less than 2uF. It should be placed closest to the VDD and GND pins.

The typical VDD capacitor configuration is shown in the figure below, C1 is 2.2uF/16V for general application.

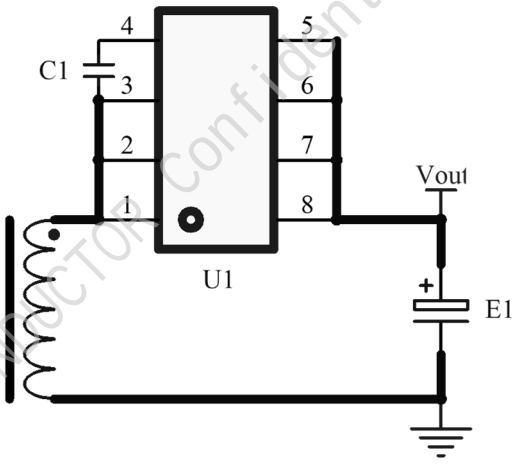


Figure 4. VDD decoupling circuit

12.2 Drain D of Switch and output of source S

LN5S100Dxx include one built-in MOSFET with 105 V withstand voltage and internal resistor less than 4 mΩ, the drain from the 5/6/7/8 pin to the outside of the chip, the source from the 1/2/3 pin to the outside of the chip, 5/6/7/8 and 1/2/3 is the main heat dissipation channel of the chip, so good 5/6/7/8 and 1/2/3 foot connections should be maintained with external copper foil in the application and the use of sufficient area of copper foil and tin plated when necessary, so as to enhance the heat dissipation capacity, to maintain the chip temperature in a reasonable range. At any time, the voltage from the D terminal to the ground shall not exceed the rated withstand voltage so as to avoid the overvoltage damage of the chip. The S terminal should always remain in close contact with the GND terminal.

13. PCB Layout Guidelines

A reasonable PCB layout should be maintained on application to ensure that the related pins if chip have as short a path as possible. In particular, D terminal should maintain the shortest connection with the transformer terminals, and the S terminal should maintain the shortest connection with the negative terminal of the output capacitor. As shown in the following figure.

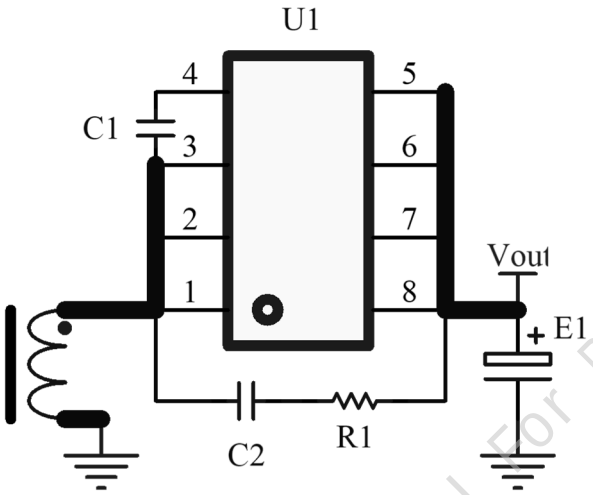


Figure 5. PCB layout recommendation

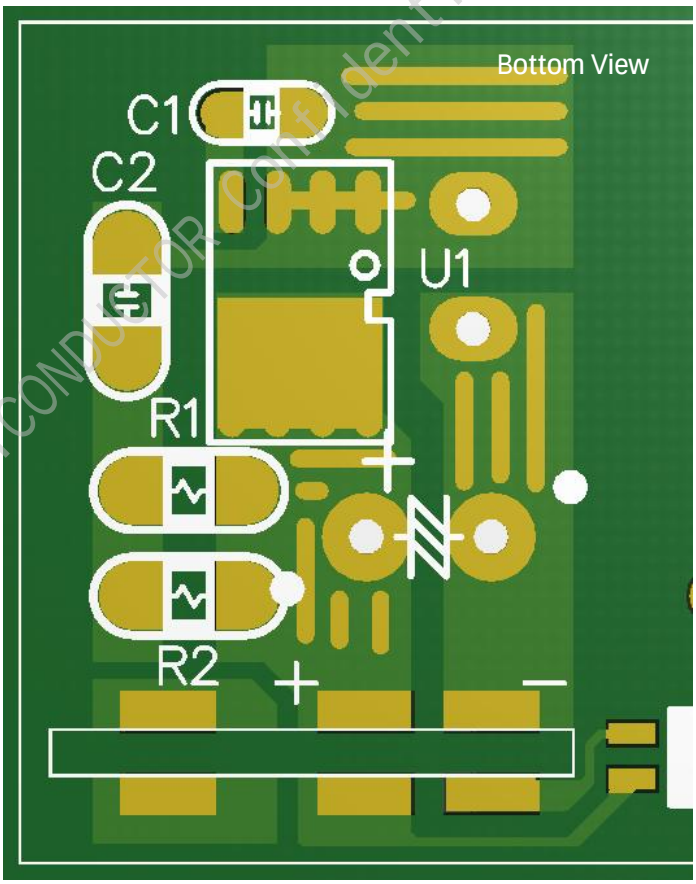


Figure 6. PCB layout demonstration

14. Typical Application Circuit Schematic (input：90~265 Vac, 65W PD Charger)

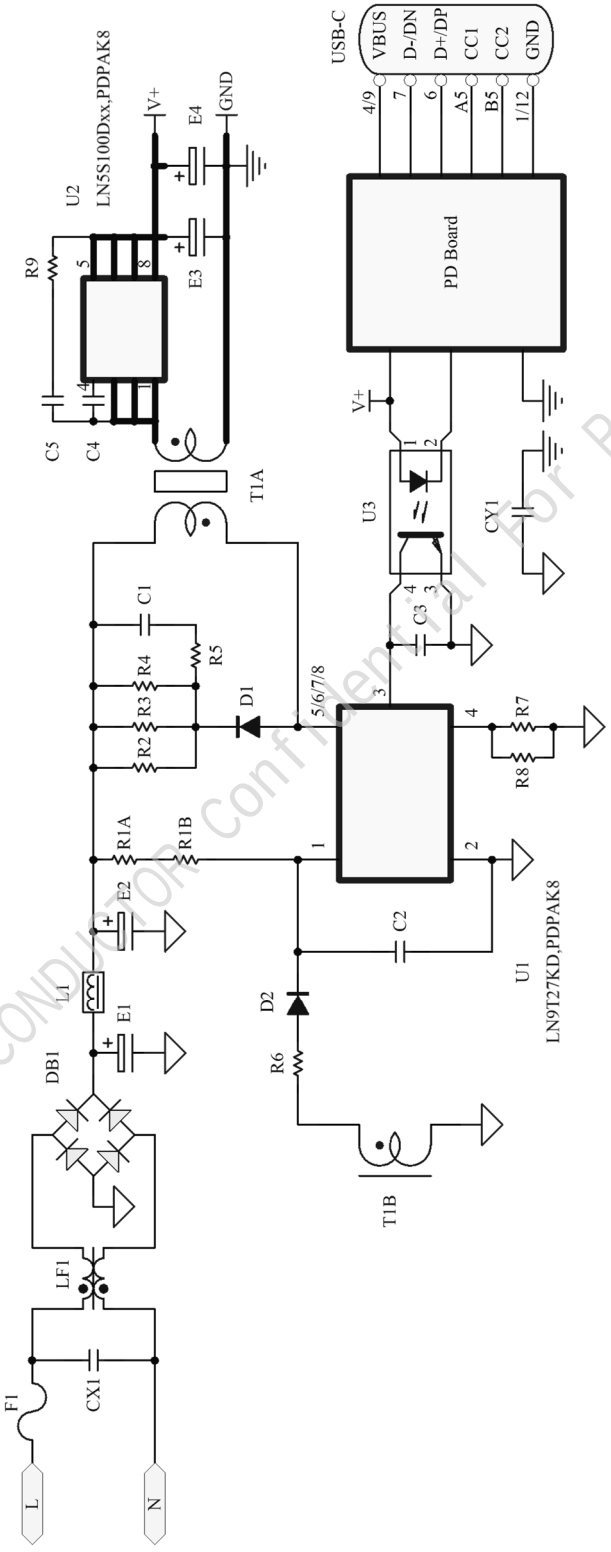


Fig7. Typical Application Circuit Schematic

15. Mechanical and Packaging

PDPAK8 (PDFN5*6)

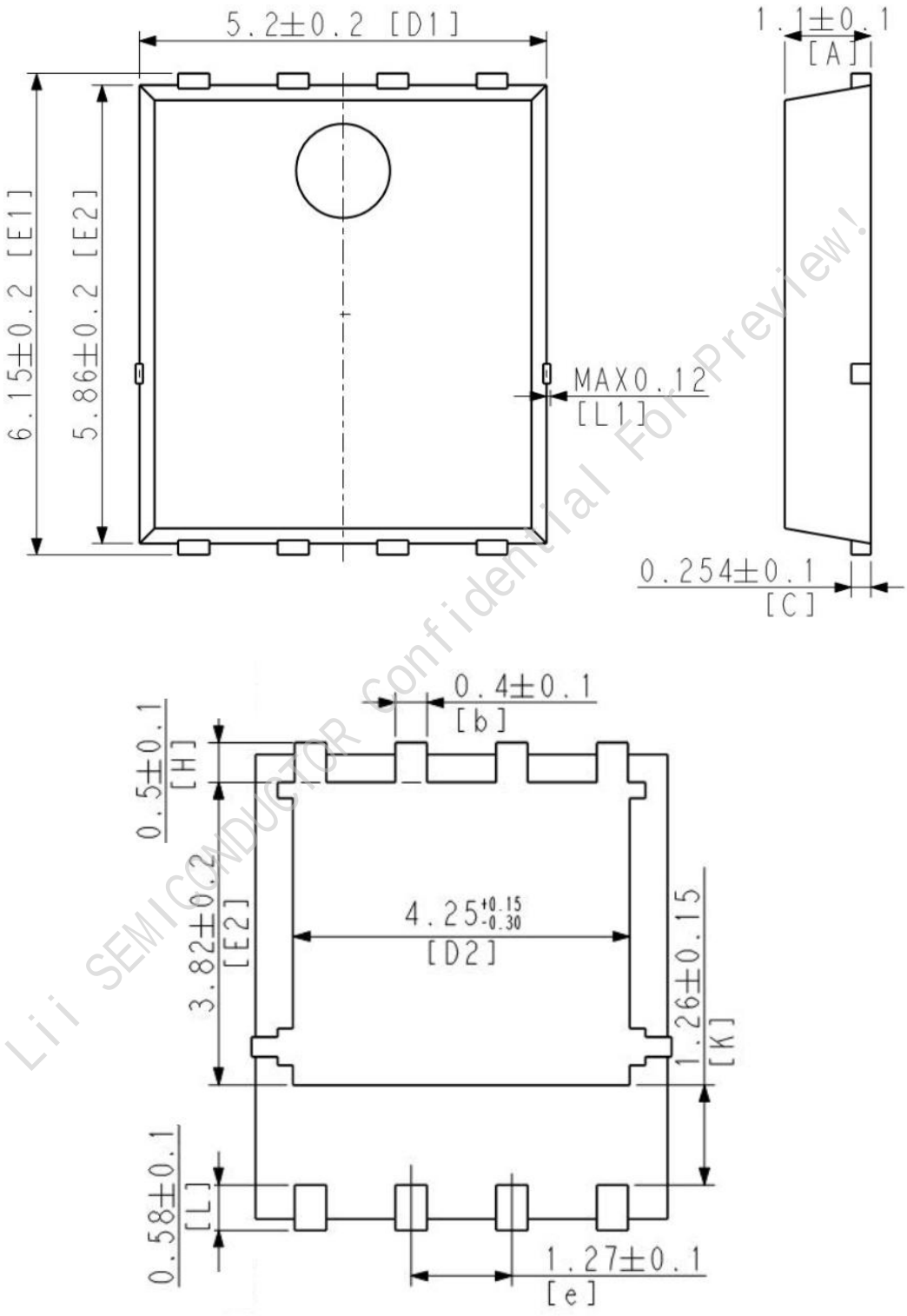


Fig8. Mechanical Dimensional Drawings

16. Orderable Information

Part Number	RdsON	BVDSS	Package	Packing Quantity
LN5S100D10	10mΩ	105V	PDPAK8	5000PCS/REEL
LN5S100D08	8mΩ	105V	PDPAK8	5000PCS/REEL
LN5S100D06	6mΩ	105V	PDPAK8	5000PCS/REEL
LN5S100D04	4mΩ	105V	PDPAK8	5000PCS/REEL

17. Important Notice

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