



# LC2731

## 34V, 100% Duty Cycle CC&CV Buck Converter

### DESCRIPTION

LC2731 has an optimum input voltage, step-down converter that operates in either CV (Constant Output Voltage) mode or CC (Constant Output Current) mode. The maximum input voltage is up to 34V and the operation input voltage from 8.5V to 32V.

MOSFET, what build in 50mΩ High-Side and 30mΩ Low-Side, could deliver up to 3.5A of continuous output current and the output current accurate to within ±7%.

No external compensation component requirement. The line compensation and the constant current can be set by an external resistance.

Independent output voltage protection suits for BC1.2 and QC2.0/3.0 dual channel output voltage.

In conclusion, LC2731 is a full function and high performance, high reliability buck DC-DC converter.

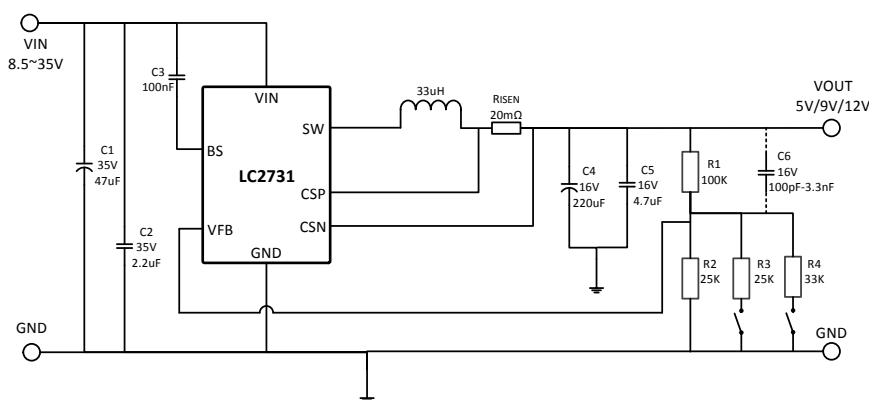
### FEATURES

- 100% Duty Cycle Car Charge Scheme
- Build in High-Side and Low-Side MOSFET
- Max Output Current: 3.5A
- Adjustable Output Voltage,  $V_{FB}=1V$
- Excellent Constant Current Accurate: ±7%
- Constant Voltage Accurate: ±2%
- No External Compensation Needed
- Jitter Function
- Efficiency: Up to 95%
- Adjustable Line Compensation
- Short Circuit Protection
- Over Voltage Protection
- Thermal shutdown Protection
- Under Voltage Lock-Out
- Available in SOP-8 package
- ESD HBM >5KV

### APPLICATIONS

- Car DVD
- Block Box
- Car Charger
- Industry Application

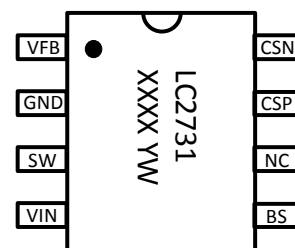
### TYPICAL APPLICATION



**Note:** 1) It is recommended to use C1 and C4 as high-frequency low-ESR capacitors for Rubycon and Würth.

2) The inductor core is recommended for the iron silicone Aluminum ring.

### PIN OUT & MARKING



SOP-8

LC2731: Product Code

XXXX: Lot No.

YW: Date code (Year & Week)

## ORDERING INFORMATION

PART No.	PACKAGE	Tape&Reel
LC2731CD8TR	SOP-8	4000/Reel

## ABSOLUTE MAXIMUM RATING

Parameter	Value
VIN to GND	-0.3 to 35 V
SW to GND	-0.3 to 32 V
BS to GND	-0.3 to 35 V
CSP, CSN, PRO to GND	-0.3 to 25 V
V <sub>FB</sub> to GND	-0.3 to 6 V
Max Operating Junction Temperature(Tj)	125°C
Ambient Temperature(Ta)	-40°C – 85°C
Package Thermal Resistance (θjc)	SOP-8 45°C / W
Storage Temperature(Ts)	-40°C – 150°C
Lead Temperature & Time	260°C, 10S
ESD (HBM)	>5000V

**Note:** Exceed these limits to damage to the device. Exposure to absolute maximum rating conditions may affect device reliability.

## ELECTRICAL CHARACTERISTICS

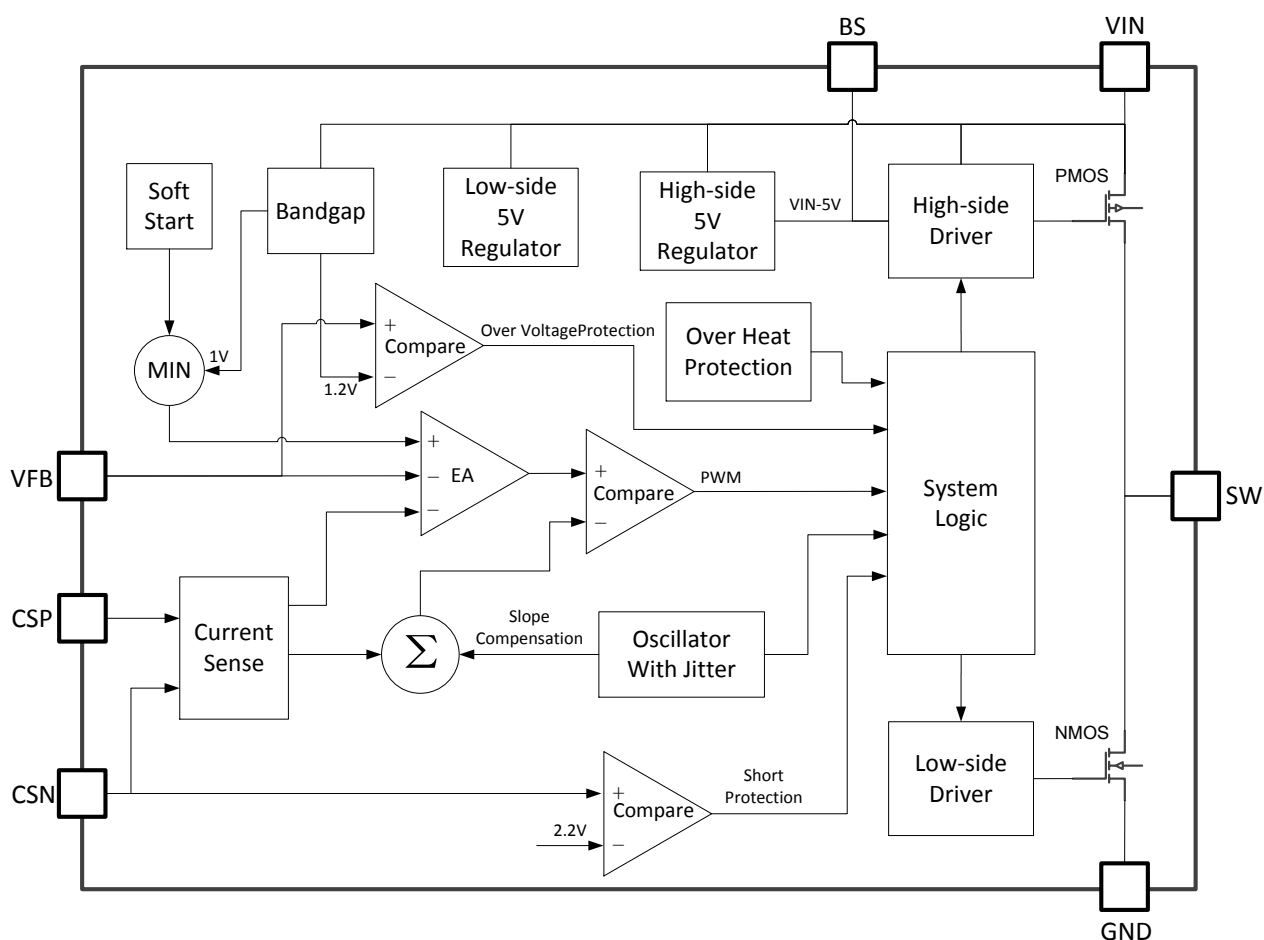
(Vin=12V, T<sub>A</sub>=25°C, unless otherwise stated)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
VIN	Input Voltage		8.5	-	34	V
V <sub>OVP-VIN</sub>	Input OVP Threshold		30	32	34	V
V <sub>UVLO</sub>	UVLO Voltage		7	8.5	9	V
	UVLO Hysteresis		-	1	-	V
I <sub>CCQ</sub>	Quiescent Current	V <sub>FB</sub> = 1.5V, force driver off.	-	1.5	2.5	mA
I <sub>SB</sub>	Standby Current	No Load, Vin>8.5V	-	1.6	3	mA
V <sub>FB</sub>	Feedback Voltage		0.98	1	1.02	V
V <sub>OVP</sub>	FB OVP detect Voltage	Internal define	-	1.2	-	V
F <sub>SW</sub>	Switching Frequency	I <sub>OUT</sub> =1A	-	135	-	KHz
D <sub>MAX</sub>	Maximum Duty Cycle		-	100	-	%
	Minimum On-Time		-	250	-	ns
Reference Of CSP-CSN	Reference Voltage Of Constant Current	0.4V<V <sub>FB</sub> <0.95V, V <sub>csn</sub> :2.6V	46.5	50	53.5	mV
V <sub>CSN</sub>	V <sub>OUT-short</sub>		2.2	2.4	2.6	V
High side	RDS <sub>ON</sub> Of Power MOS	I <sub>OUT</sub> =1A	-	50	70	mΩ
Low side		I <sub>OUT</sub> =1A	-	30	45	mΩ
T <sub>SD</sub>	Thermal shutdown Temp		-	155	-	°C
T <sub>SH</sub>	Thermal Shutdown Hysteresis		-	30	-	°C

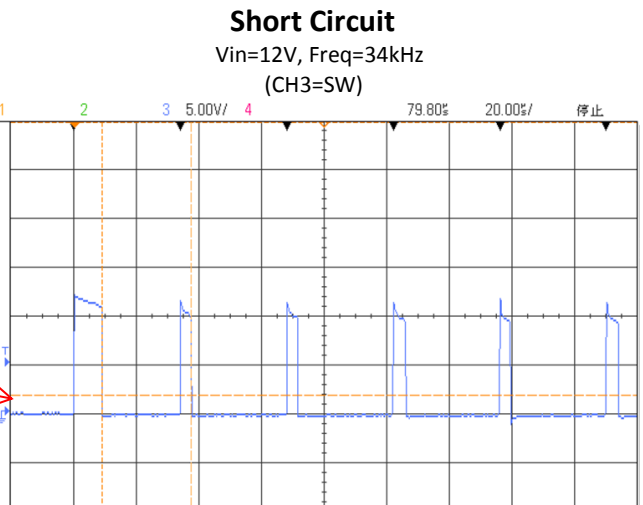
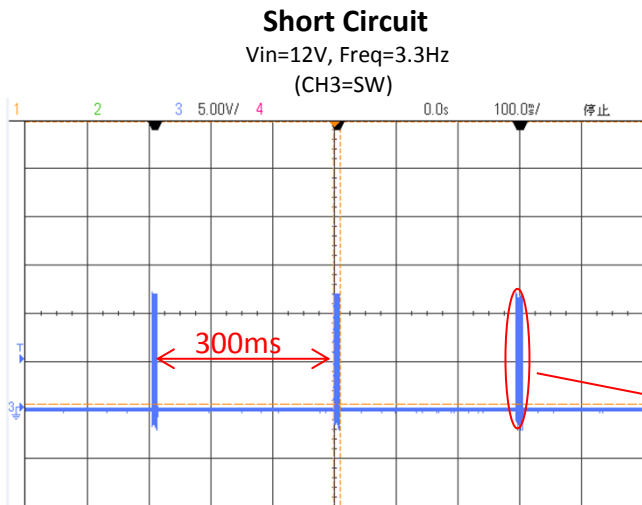
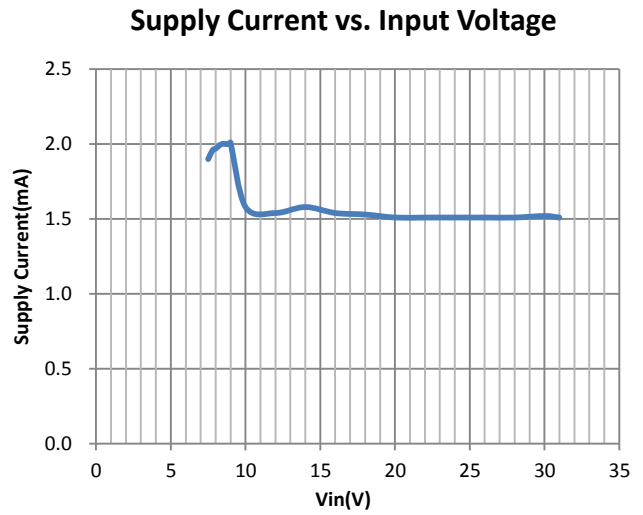
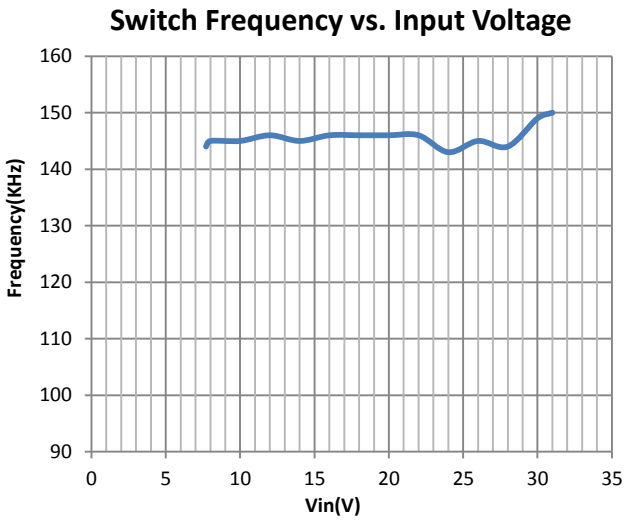
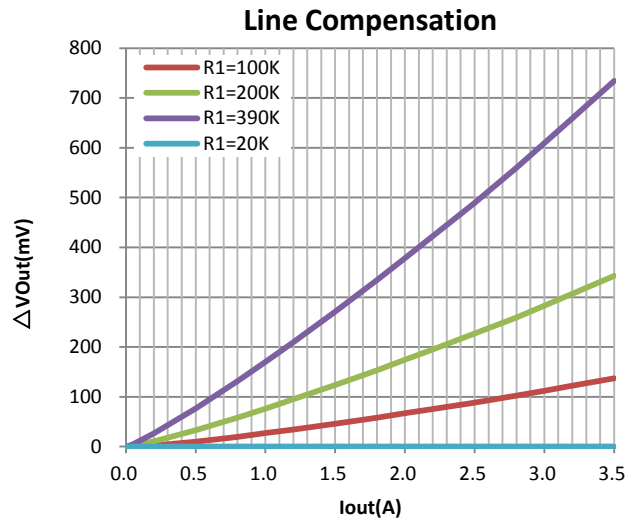
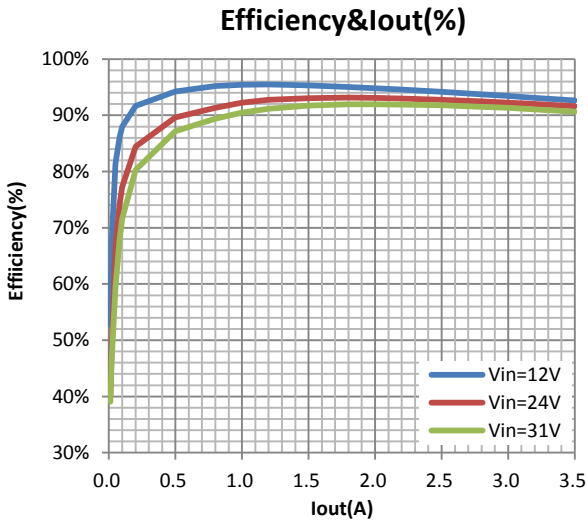
## PIN DESCRIPTION

PIN #	NAME	DESCRIPTION
1	VFB	Feedback Voltage
2	GND	Ground
3	SW	Power Switching Output Connect to External Inductor
4	VIN	Power Supply Input. Place a 2.2μF ceramic capacitor between VIN and GND as close as possible
5	BS	Power to the internal high-side MOSFET gate driver. Connect a 100nF capacitor from BS to VIN
6	NC	Not Connected
7	CSP	Current Sense Input_P
8	CSN	Current Sense Input_N

## BLOCK DIAGRAM

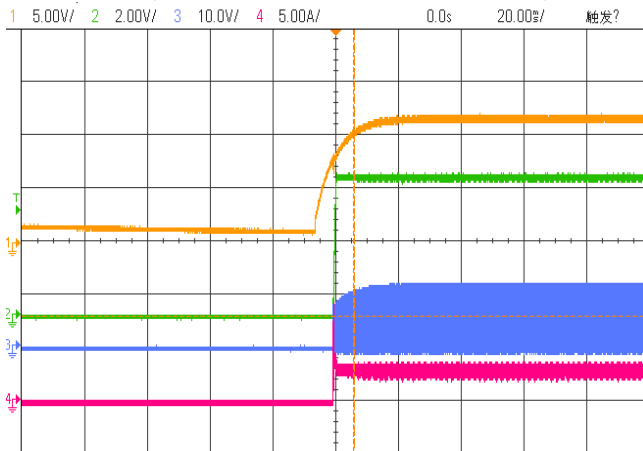


## TYPICAL PERFORMANCE CHARACTERISTICS



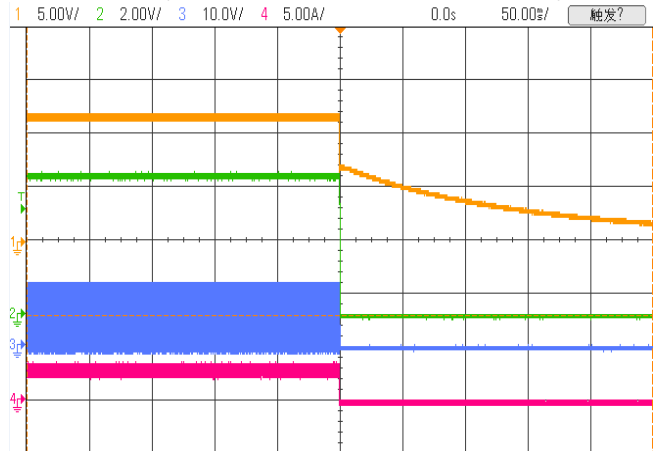
## Power On

Vin=12V, Vout=5V, Iout=3A  
(CH1=Vin, CH2=Vout, CH3=SW, CH4=Isw)



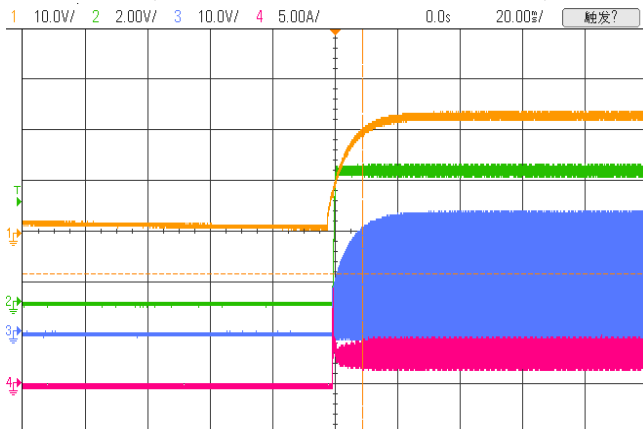
## Power Off

Vin=12V, Vout=5V, Iout=3A  
(CH1=Vin, CH2=Vout, CH3=SW, CH4=Isw)



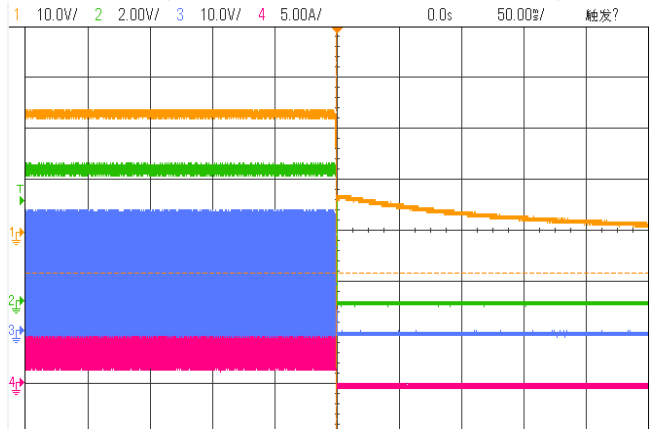
## Power On

Vin=24V, Vout=5V, Iout=3A  
(CH1=Vin, CH2=Vout, CH3=SW, CH4=Isw)



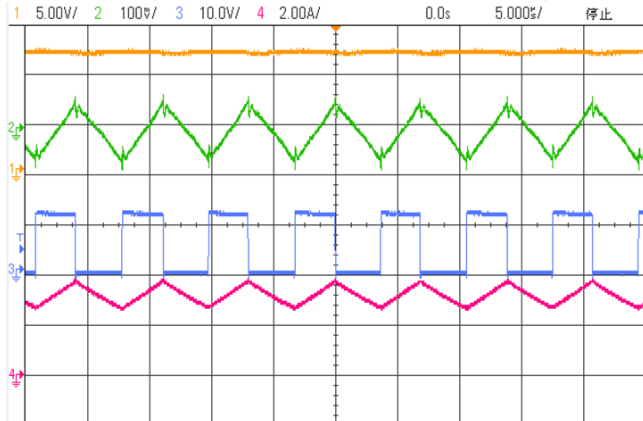
## Power Off

Vin=24V, Vout=5V, Iout=3A  
(CH1=Vin, CH2=Vout, CH3=SW, CH4=Isw)



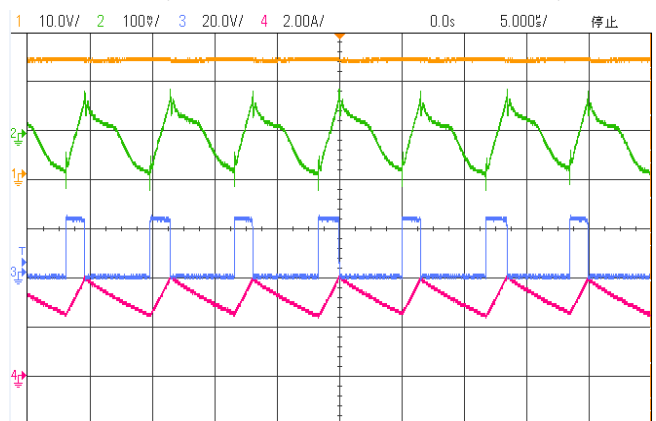
## Output Voltage Ripple

Vin=12V, Vout=5V, Iout=3A  
(CH1=Vin, CH2=Vout, CH3=SW, CH4=Isw)



## Output Voltage Ripple

Vin=24V, Vout=5V, Iout=3A  
(CH1=Vin, CH2=Vout, CH3=SW, CH4=Isw)



## DETAILED DESCRIPTION

### Input Under Voltage Protection

LC2731 provides an input voltage up to 34V and operates from an input voltage range of 8.5V to 32V. If VIN drops below 7.5V, the UVLO circuit inhibits switching. Once VIN rises above 8.5V, the UVLO clears, and the soft-start sequence activates.

### Input Over Voltage Protection

If VIN rises above 32V, the UVLO circuit inhibits switching. LC2731 will not be damaged until the voltage exceeds 34V. Once VIN drops below 30V, the UVLO clears, and the soft-start sequence activates.

### Soft-start

LC2731 has an internal soft-start circuitry to reduce supply inrush current during startup conditions. When the device exits under-voltage lockout (UVLO), shutdown mode, or restarts following a thermal-overload event, the soft-start circuitry slowly ramps up current available after 300us.

### Constant Voltage Output

LC2731 presets the V<sub>FB</sub> voltage to 1V. The Output Voltage can be set by extra resistance.

### Output Over Voltage Protection

Once V<sub>FB</sub> rises above 1.2V, LC2731 shuts down to avoid damage caused by abnormal use of electrical equipment.

### Constant Current Output

LC2731 senses the current by sampling the voltage difference between the CSP and the CSN, and

adjusts the output current to the default value by the loop.

$$I_{OUT} = \frac{50mV}{R_{ISEN}}$$

Constant current operates normally when CSN is higher than 2.4V. When CSN is below 2.4V causing by overload, LC2731 will enter short circuit protection mode.

### Short Circuit Protection

When CSN drops below 2.4V since too heavy load, LC2731 will enter short circuit protection function, and the system will enter hit-cup mode, and frequency drop to 34KHz per cycle and stop switching for 300mS.

### Line Compensation

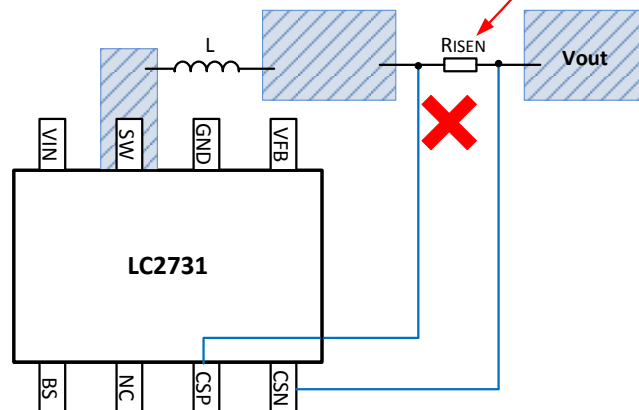
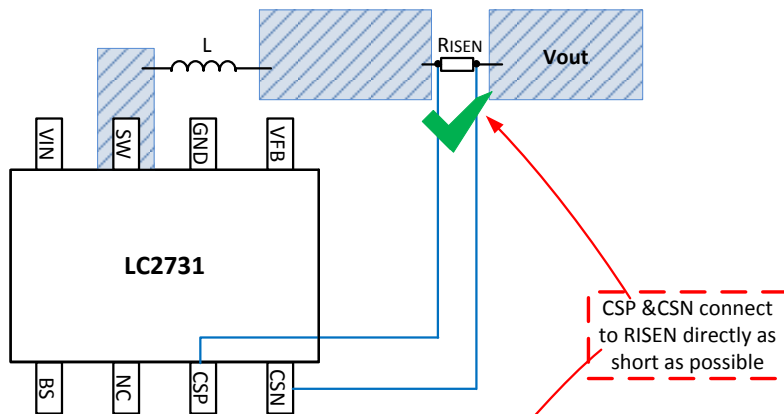
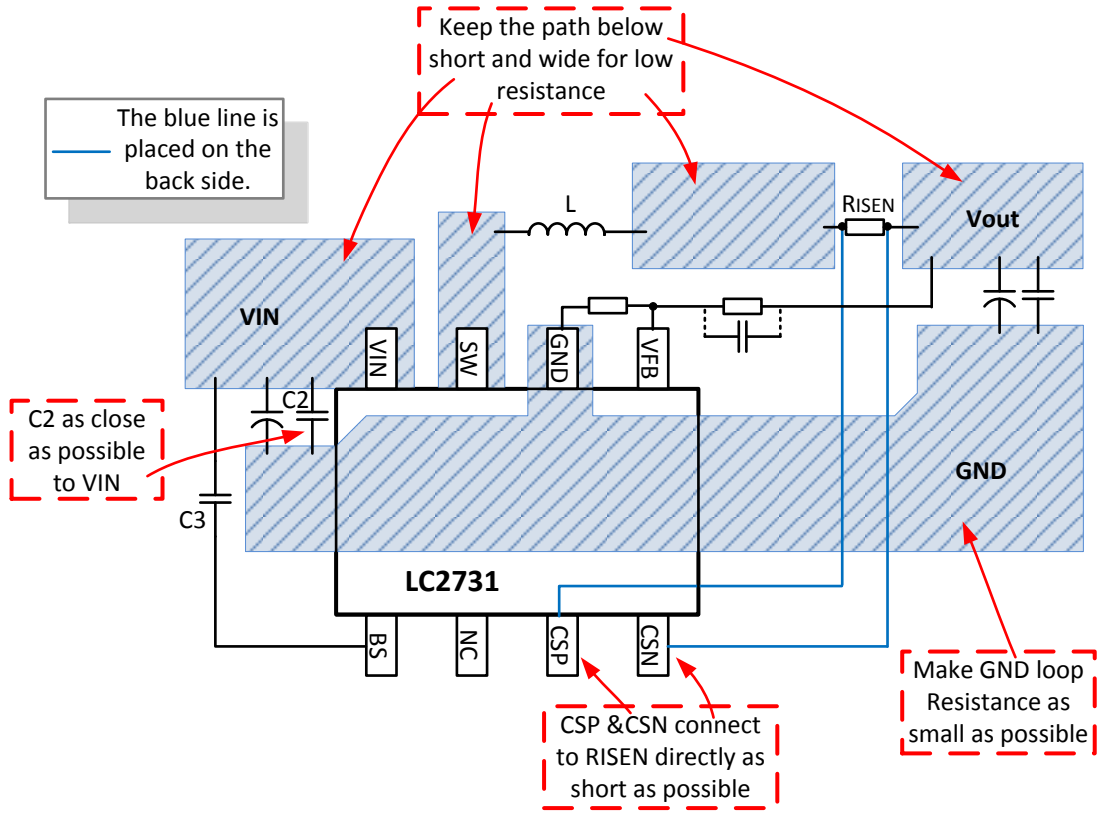
When users use different cables, it will produce different voltage drop, the users can set their own cable compensation voltage according to the need:

$$V_{cable\ compensation} = 1.6\mu A * R1 * \frac{V_{CSP} - V_{CSN}}{50mV}$$

### Thermal Shutdown

The junction temperature of the IC is monitored internally. If the junction temperature exceeds the threshold value (typically 155°C), the converter shuts off. This is non-latch protection. There is about 30°C hysteresis. Once the junction temperature drops around 125°C, it initiates a Soft-start.

## LAYOUT GUIDE



## PACKAGE OUTLINE

Package	SOP-8	Devices per reel	4000	Unit	mm																																																																																												
Package specification:																																																																																																	
				<p>COMMON DIMENSIONS (UNITS OF MEASURE=MILLIMETER)</p> <table border="1"> <thead> <tr> <th>SYMBOL</th> <th>MIN</th> <th>NOM</th> <th>MAX</th> </tr> </thead> <tbody> <tr><td>A</td><td>1.35</td><td>1.55</td><td>1.75</td></tr> <tr><td>A1</td><td>0.10</td><td>0.15</td><td>0.25</td></tr> <tr><td>A2</td><td>1.25</td><td>1.40</td><td>1.65</td></tr> <tr><td>A3</td><td>0.50</td><td>0.60</td><td>0.70</td></tr> <tr><td>b</td><td>0.38</td><td>—</td><td>0.51</td></tr> <tr><td>b1</td><td>0.37</td><td>0.42</td><td>0.47</td></tr> <tr><td>e</td><td>0.17</td><td>—</td><td>0.25</td></tr> <tr><td>e1</td><td>0.17</td><td>0.20</td><td>0.23</td></tr> <tr><td>D</td><td>4.80</td><td>4.90</td><td>5.00</td></tr> <tr><td>E</td><td>5.80</td><td>6.00</td><td>6.20</td></tr> <tr><td>E1</td><td>3.80</td><td>3.90</td><td>4.00</td></tr> <tr><td>e</td><td colspan="3">1.27BSC</td></tr> <tr><td>L</td><td>0.45</td><td>0.60</td><td>0.80</td></tr> <tr><td>L1</td><td colspan="3">1.04REF</td></tr> <tr><td>L2</td><td colspan="3">0.25BSC</td></tr> <tr><td>R</td><td>0.07</td><td>—</td><td>—</td></tr> <tr><td>R1</td><td>0.07</td><td>—</td><td>—</td></tr> <tr><td>h</td><td>0.30</td><td>0.40</td><td>0.50</td></tr> <tr><td>theta 1</td><td>0°</td><td>—</td><td>8°</td></tr> <tr><td>theta 2</td><td>15°</td><td>17°</td><td>19°</td></tr> <tr><td>theta 3</td><td>11°</td><td>13°</td><td>15°</td></tr> <tr><td>theta 4</td><td>15°</td><td>17°</td><td>19°</td></tr> </tbody> </table>		SYMBOL	MIN	NOM	MAX	A	1.35	1.55	1.75	A1	0.10	0.15	0.25	A2	1.25	1.40	1.65	A3	0.50	0.60	0.70	b	0.38	—	0.51	b1	0.37	0.42	0.47	e	0.17	—	0.25	e1	0.17	0.20	0.23	D	4.80	4.90	5.00	E	5.80	6.00	6.20	E1	3.80	3.90	4.00	e	1.27BSC			L	0.45	0.60	0.80	L1	1.04REF			L2	0.25BSC			R	0.07	—	—	R1	0.07	—	—	h	0.30	0.40	0.50	theta 1	0°	—	8°	theta 2	15°	17°	19°	theta 3	11°	13°	15°	theta 4	15°	17°	19°
SYMBOL	MIN	NOM	MAX																																																																																														
A	1.35	1.55	1.75																																																																																														
A1	0.10	0.15	0.25																																																																																														
A2	1.25	1.40	1.65																																																																																														
A3	0.50	0.60	0.70																																																																																														
b	0.38	—	0.51																																																																																														
b1	0.37	0.42	0.47																																																																																														
e	0.17	—	0.25																																																																																														
e1	0.17	0.20	0.23																																																																																														
D	4.80	4.90	5.00																																																																																														
E	5.80	6.00	6.20																																																																																														
E1	3.80	3.90	4.00																																																																																														
e	1.27BSC																																																																																																
L	0.45	0.60	0.80																																																																																														
L1	1.04REF																																																																																																
L2	0.25BSC																																																																																																
R	0.07	—	—																																																																																														
R1	0.07	—	—																																																																																														
h	0.30	0.40	0.50																																																																																														
theta 1	0°	—	8°																																																																																														
theta 2	15°	17°	19°																																																																																														
theta 3	11°	13°	15°																																																																																														
theta 4	15°	17°	19°																																																																																														
		<p>BASE METAL SECTION B-B</p>																																																																																															



代理商：深圳市琪远电子有限公司  
 电话:(0755)86228541 / 17727576605  
 更多产品请访问：www.siitek.com.cn