LC2740

42V, 100% Duty Cycle CC&CV Buck Converter

DESCRIPTION

LC2740 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 42V and the operation input voltage from 8.5V to 32V.

MOSFET, what build in 35mΩ High-Side and 25mΩ Low-Side, could deliver up to 3A 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, LC2740 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: 3A
- 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
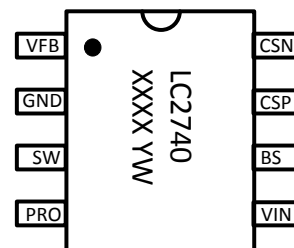- Under Voltage Lock Output
- Available in SOP-8 package

APPLICATIONS

- Car DVD
- Black Box
- Car Charger
- Industry Application

TYPICAL APPLICATION
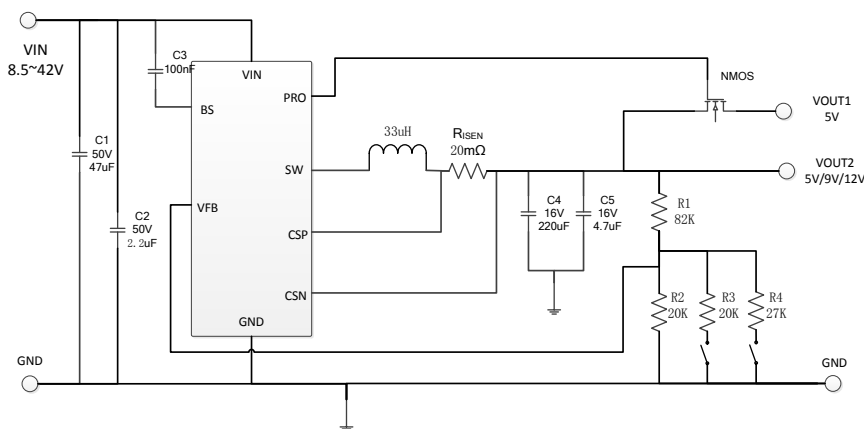
PIN OUT & MARKING

SOP-8

LC2740: Product Code
XXXX：Lot No.
YW: Date code (Year & Week)

ORDERING INFORMATION

PART No.	PACKAGE	Tape&Reel
LC2740CD8TR	SOP-8	4000/Reel

ABSOLUTE MAXIMUM RATING

Parameter		Value
VIN to GND		-0.3 to 42 V
SW to GND		-0.3 to 32 V
BS to GND		-0.3 to 42 V
CSP, CSN, PRO to GND		-0.3 to 25 V
V_{FB} 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)		>2000V

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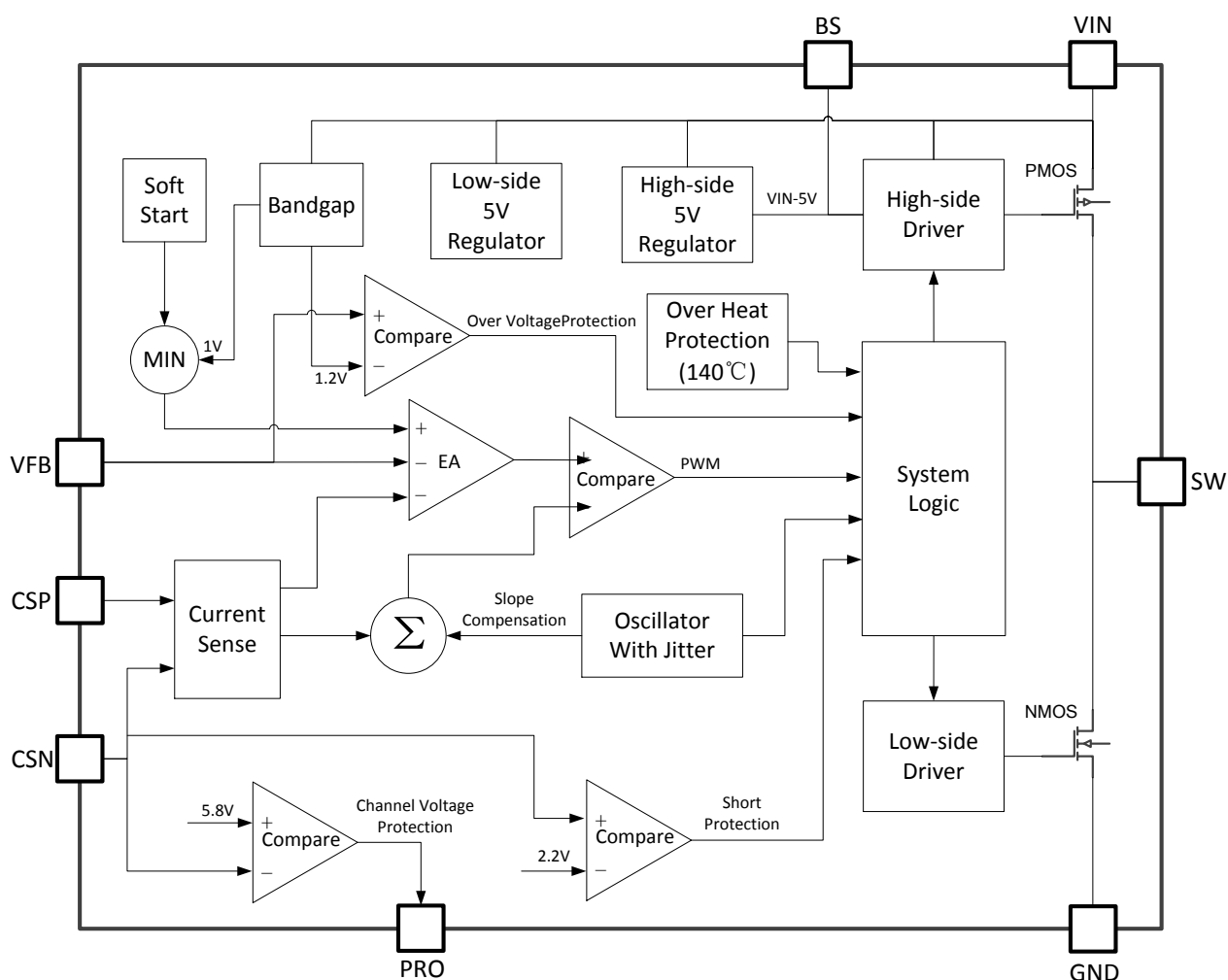
ELECTRICAL CHARACTERISTICS

(Vin=12V, T_A=25°C, unless otherwise stated)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
VIN	Input Voltage		8.5	-	42	V
$V_{OVP-VIN}$	Input OVP Threshold		31	32	33	V
V_{UVLO}	UVLO Voltage		7	8.5	9	V
	UVLO Hysteresis		0.3	0.5	0.8	V
I_{CCQ}	Quiescent Current	V_{FB} = 1.5V, force driver off.	-	1.5	-	mA
I_{SB}	Standby Current	No Load	-	1.6	5	mA
V_{FB}	Feedback Voltage		0.98	1	1.02	V
V_{OVP}	Ouput OVP detect Voltage	Internal define	-	1.2	-	V
F_{SW}	Switching Frequency	I_{OUT}=1A	120	135	155	KHz
D_{MAX}	Maximum Duty Cycle			100		%
	Minimum On-Time			250		ns
Reference Of CSP-CSN	Reference Voltage Of Constant Current	0.4V<V_{FB}<0.95V	46.5	50	53.5	mV
V_{CSN}	$V_{OUT-Short}$		2.2	2.4	2.6	V
High side	RDS$_{ON}$ Of Power MOS	I_{OUT}=1A	30	35	40	m Ω
Low side		I_{OUT}=1A	22	25	30	m Ω
T_{SD}	Thermal shutdown Temp		-	140	-	°C
T_{SH}	Thermal Shutdown Hysteres		-	30	-	°C

PIN DESCRIPTION

PIN #	NAME	DESCRIPTION
1	VFB	Feedback Voltage
2	GND	Ground
3	SW	Power Switching Output Connect to External Inductor
4	PRO	Protection for Over Output Voltage
5	VIN	Power Supply Input. Place a 2.2µF ceramic capacitor between VIN and GND as close as possible
6	BS	Power to the internal high-side MOSFET gate driver. Connect a 100nF capacitor from BS to VIN
7	CSP	Current Sense Input_P
8	CSN	Current Sense Input_N

BLOCK DIAGRAM

TYPICAL PERFORMANCE CHARACTERISTICS

Efficiency&Iout（%）

△Vout& Iout

Switch Frequency vs. Input Voltage

Supply Current vs. Input Voltage

Short Circuit
Vin=12V, Vout=5V, Freq=3.3Hz
(CH3=SW)

Short Circuit
Vin=12V, Vout=5V, Freq=34kHz
(CH3=SW)
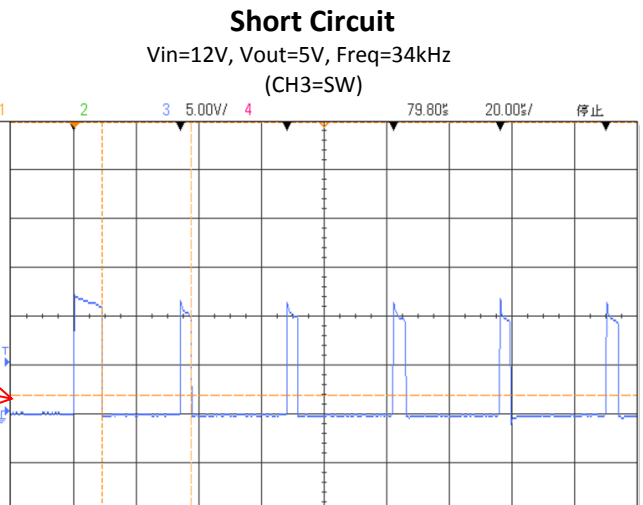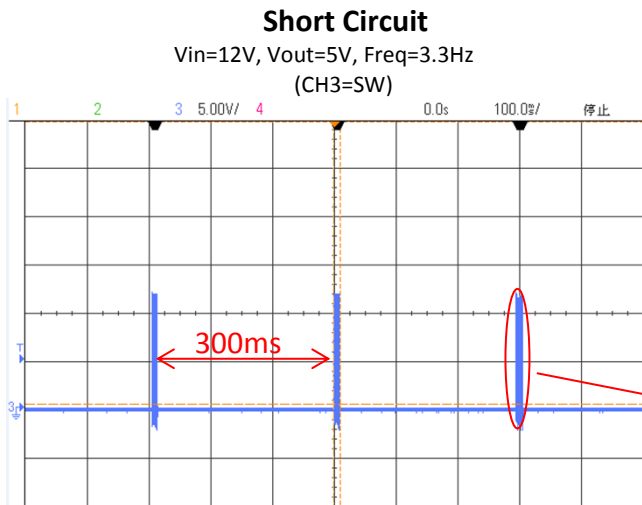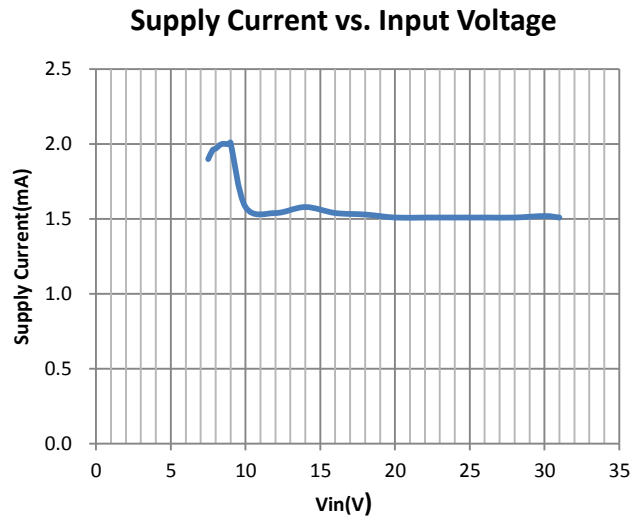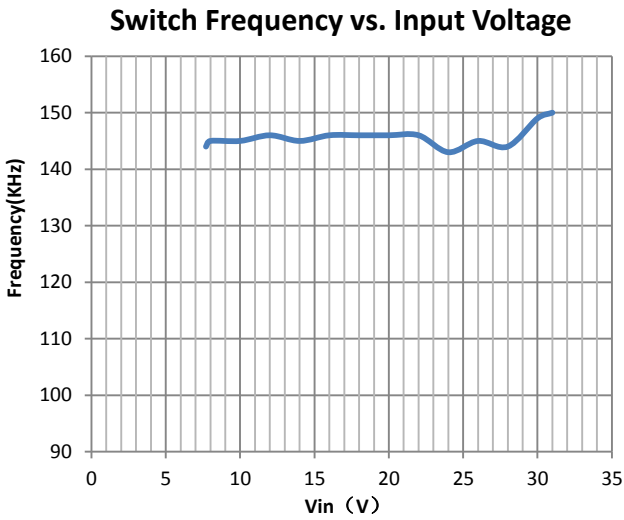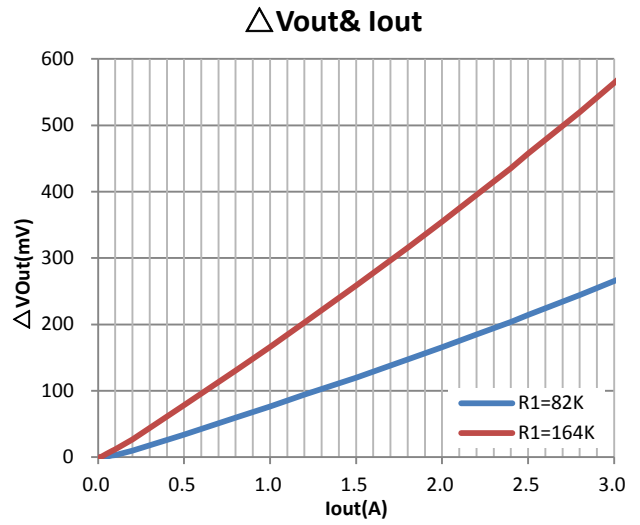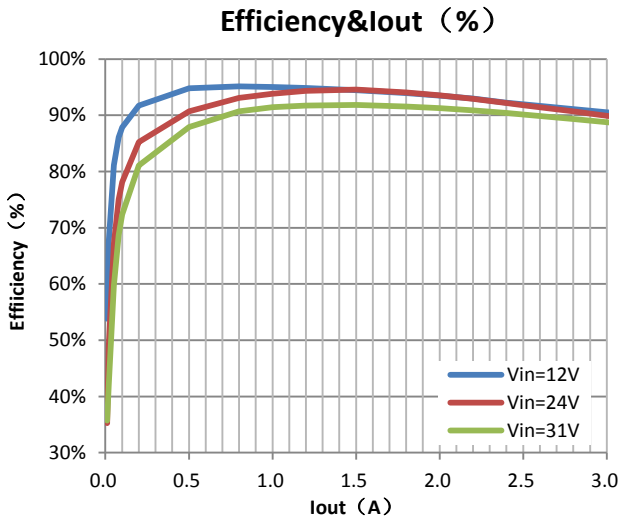
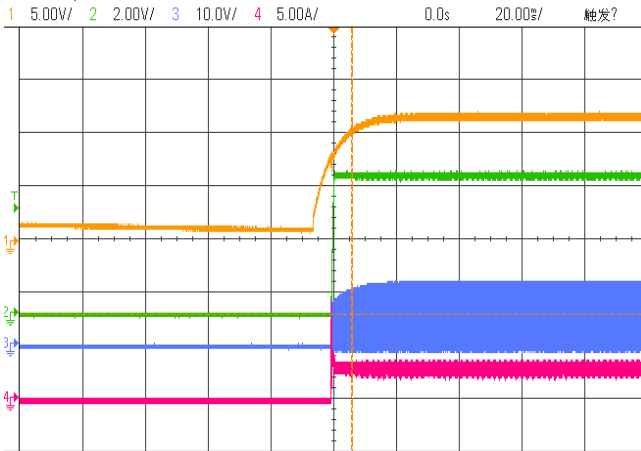### Power On
Vin=12V, Vout=5V, Iout=3A
(CH1=Vin, CH2=Vout, CH3=SW, CH4=Isw)

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

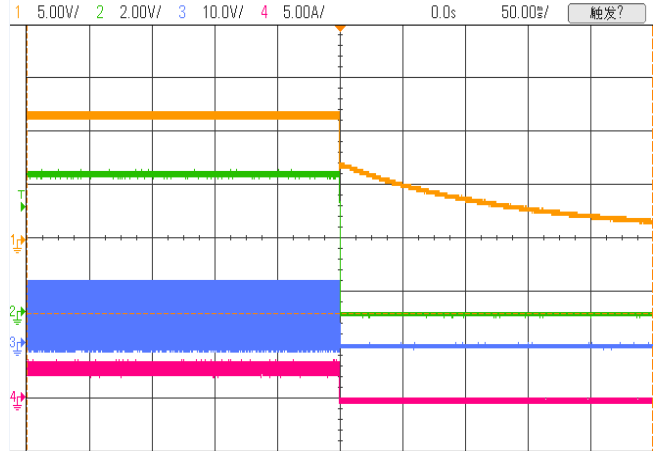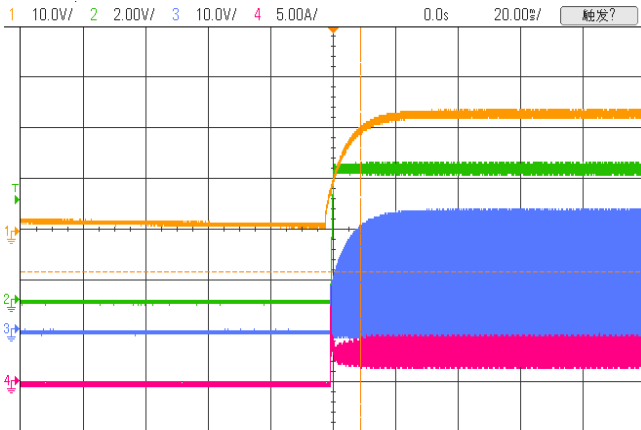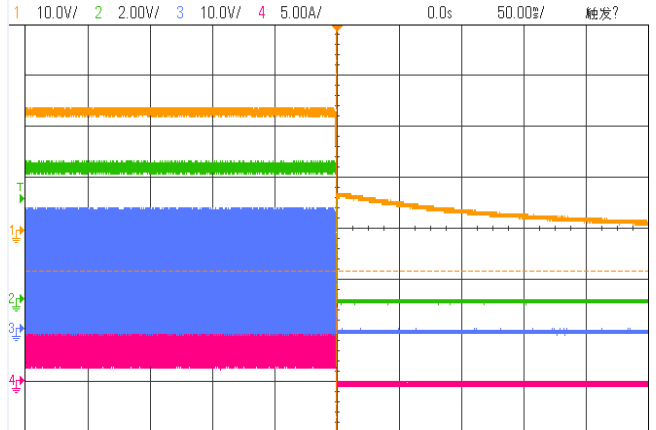### Power On
Vin=24V, Vout=5V, Iout=3A
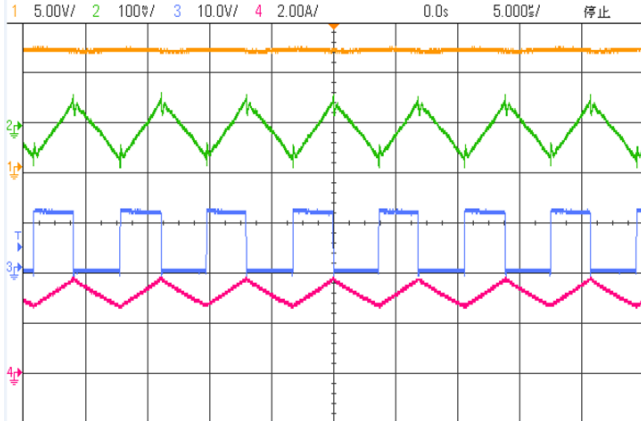(CH1=Vin, CH2=Vout, CH3=SW, CH4=Isw)

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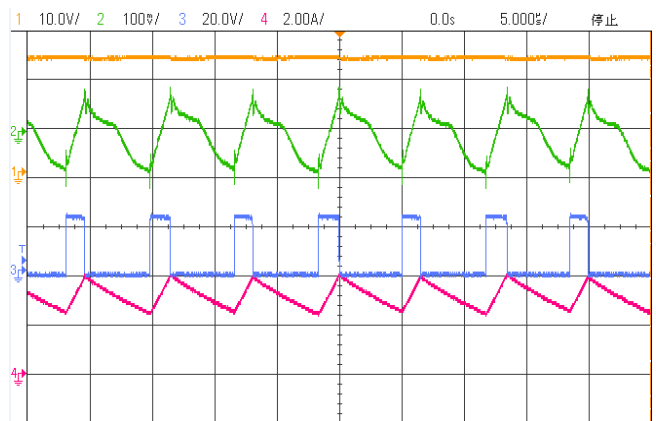(CH1=Vin, CH2=Vout, CH3=SW, CH4=Isw)

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

LC2740 provides an input voltage up to 42V and operates from an input voltage range of 8.5V to 32V. If VIN drops below 7V, 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. LC2740 will not be damaged until the voltage exceeds 42V. Once VIN drops below 30V, the UVLO clears, and the soft-start sequence activates.

Soft-start

LC2740 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

LC2740 presets the V_{FB} voltage to 1V. The Output Voltage can be set by extra resistance.

Output Channel Protection
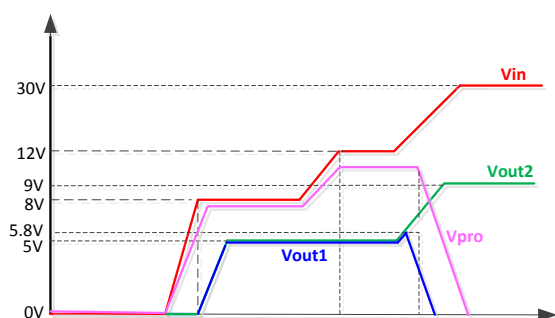
Output Over Voltage Protection

Once V_{FB} rises above 1.2V, LC2740 shuts down to avoid damage caused by abnormal use of electrical equipment.

Constant Current Output

LC2740 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 2.2V causing by overload, LC2740 will enter short circuit protection mode.

Short Circuit Protection

When CSN drops below 2.2V since too heavy load, LC2740 will enter short circuit protection function, and the system will enter hit-cup mode, and frequency drop to 40KHZ 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:

$$V_{cable\ compensation} = 3.7uA * R1 * \frac{V_{CSP} - V_{CSN}}{50mV}$$

Thermal Shutdown

Thermal-overload protection limits total power dissipation in the device. When the junction temperature exceeds TJ= +150°C, a thermal sensor forces the device into shutdown, allowing the die to cool. The thermal sensor turns the device on again after the junction temperature cools by 25°C, resulting in a pulsed output during continuous overload conditions. Following a thermal-shutdown condition, the soft-start sequence begins.

Application Information

Layout is critical to achieve clean and stable operation. The switching power stage requires particular attention. Follow these guidelines for good PC board layout:

1) Place decoupling capacitors as close to the IC as possible
2) Connect input and output capacitors to the same power ground node with a star ground configuration then to IC ground.
3) Keep the high-current paths as short and wide as possible. Keep the path of switching current (C1 to VIN and C1 to GND) short. Avoid vias in the switching paths.
4) If possible, connect VIN, SW, and GND separately to a large copper area to help cool

the IC to further improve efficiency and long-term reliability.

5) Ensure all feedback connections are short and direct. Place the feedback resistors as close to the IC as possible.

6) Route high-speed switching nodes away from sensitive analog areas

PACKAGE OUTLINE

Package	SOP-8	Devices per reel	4000	Unit	mm

Package specification：

COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

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
c	0.17	–	0.25
c1	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
θ	0°	–	8°
θ1	15°	17°	19°
θ2	11°	13°	15°
θ3	15°	17°	19°
θ4	11°	13°	15°