上海贝岭
SHANGHAI BELLING

BLL2741Q

Qualified for Automotive Application

35V, 4A CV and Dual CC Step-Down DC/DC Converter

DESCRIPTION

BLL2741Q 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 35V and the operation input voltage from 8.5V to 35V.

MOSFET, what build in 75mΩ high-side, could deliver up to 4A of continuous output current and the output current accurate to within ±7%.

External compensation is not needed. It consists of inside line compensation function with 150mV at V_{IN}=12V, I_{OUT}=4A.

In conclusion, BLL2741Q is a full function and high performance, high reliability buck DC-DC converter.

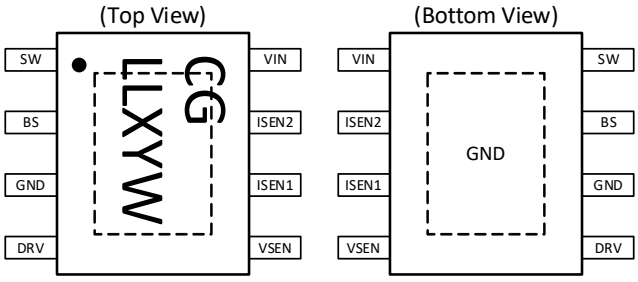
FEATURES

- Build in high-side and low-side MOSFET
- Max output current: 4A
- Constant output voltage: 5.1V
- Excellent constant current accurate: ±7%
- Constant voltage accurate: ±2%
- No external compensation needed
- Jitter function
- Efficiency: up to 95%
- Line compensation:
  150mV@ V_{IN}=12V, I_{OUT}=4A (Typ.)
- Short circuit protection
- Over voltage protection
- Thermal shutdown protection
- Under voltage lock-out
- Available in ESOP-8 package
- ESD HBM >5KV
- Available in AEC-Q100 Grade2

APPLICATIONS

- Car DVD
- Black box
- Car charger
- Industry application

PIN OUT & MARKING



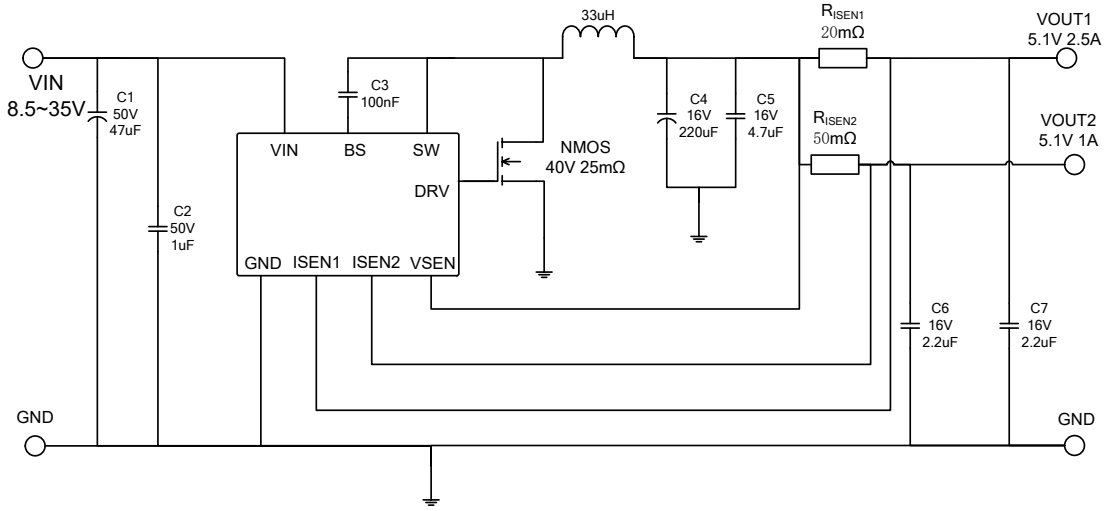
ESOP-8

CG: Product code
LL: Lot No.
X: Fab code
YW: Date code (Year & Week)

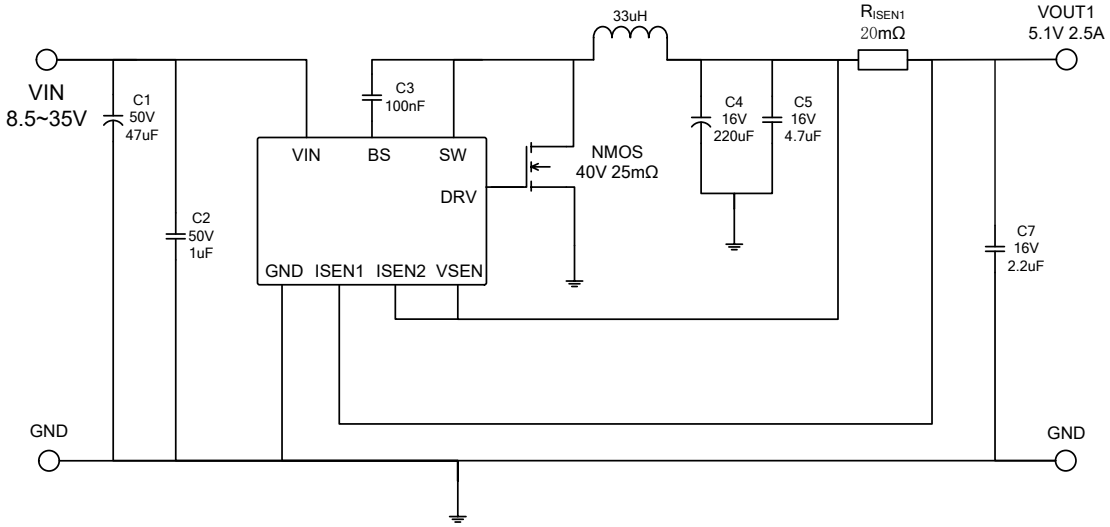
ORDERING INFORMATION

Part No.	Package	Tape&Reel
BLL2741QCS8TR	ESOP-8	2500/Reel

TYPICAL APPLICATION



Dual Channel Application



Single Channel Application

Note: *1) It is recommended to use C1 and C4 as high-frequency low-ESR capacitors for Rubycon and Wurth.*
2) The inductor core is recommended for the iron silicone Aluminum ring.
3) Pin VSEN is shorted to pin ISEN2 in single channel application.

PIN DESCRIPTION

PIN #	NAME	DESCRIPTION
1	SW	Power switching output connect to external inductor.
2	BS	Power to the internal high-side MOSFET gate driver. Connect a 100nF capacitor from BS to VIN.
3	GND	Ground.
4	DRV	Driver of low side NMOS. Connect to the gate of NMOS.
5	VSEN	Sense of output voltage.
6	ISEN1	Current sense input 1.
7	ISEN2	Current sense input 2.
8	VIN	Power supply input. Place a 10μF ceramic capacitor between VIN and GND as close as possible.
9	Thermal PAD	Ground.

ABSOLUTE MAXIMUM RATING

Parameter		Value
VIN to GND		-0.3V to 40V
SW to GND		-0.3V to VIN
BS to GND		(V_{SW}-0.3V) to (V_{SW}+6V)
ISEN1, ISEN2, DRV, VSEN to GND		-0.3V to 6V
Operating junction temperature (T_J)		-40°C to 125°C
Ambient temperature (T_A)		-40°C to 105°C
Package thermal resistance (θ_{JC})	ESOP-8	10°C/W
Storage temperature (T_S)		-40°C to 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.

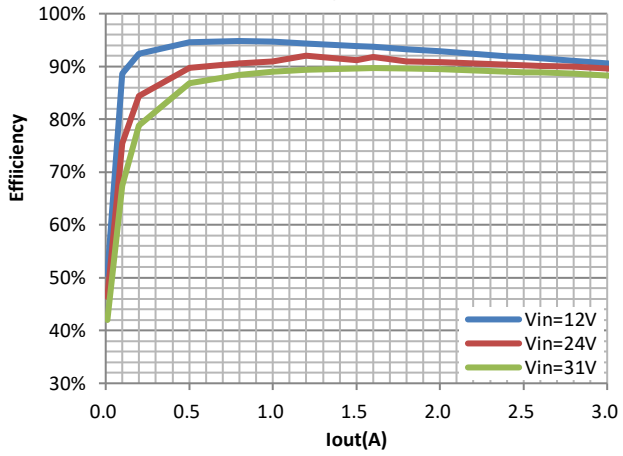
ELECTRICAL CHARACTERISTICS

(V_{IN}=12V, T_A=25°C, unless otherwise stated.)

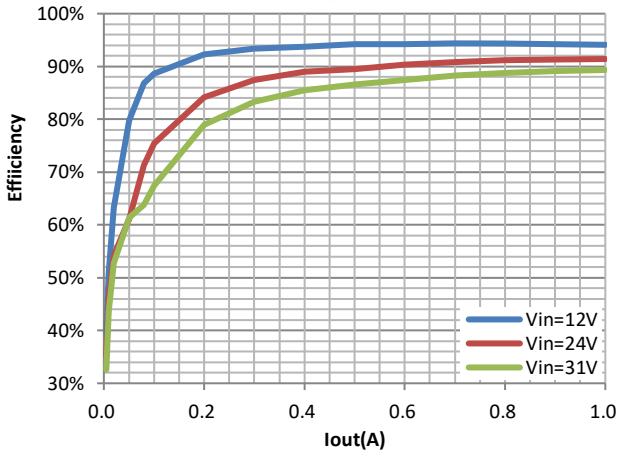
Symbol	Parameter	Conditions	Min	Typ	Max	Units
V_{IN}	Input voltage		8.5	-	35	V
$V_{OVP-VIN}$	Input OVP threshold		-	35	-	V
V_{UVLO}	UVLO voltage		-	8.5	9	V
	UVLO hysteresis		-	1	-	V
I_{CCQ}	Quiescent current	V_{SENSE}=5.8V	-	1.5	2.5	mA
I_{SB}	Standby current	No load, V_{IN}>8.5V	-	1.6	-	mA
V_{OUT}	Output voltage	I_{OUT}=1A	4.998	5.1	5.202	V
V_{SEN}	Output OVP detect voltage	Internal define	-	6.2	-	V
F_{SW}	Switching frequency	I_{OUT}=1A	-	135	-	KHz
Reference of CSP-CSN	Reference voltage of constant current	2.4V<V_{OUT}<4.5V	46.5	50	53.5	mV
V_{CSN}	$V_{OUT-Short}$		1	1.2	1.5	V
High side	R_{DSON} of power MOS	I_{OUT}=1A	-	75	-	mΩ
Low side		I_{OUT}=1A	-	10	-	Ω
D_{MAX}	Maximum duty cycle		-	95	-	%
	Minimum on-time		-	120	-	ns
	Line compensation	V_{IN}=12V, I_{OUT}=4A	-	150	-	mV
I_{LIMIT}	Secondary cycle-by-cycle current limit	Minimum duty cycle, no CC	-	6.5	-	A
$IMAX_{SINK}$	DRV MAX current		-	-	1.2	A
$IMAX_{PULL}$			-	-	0.7	A
T_{SD}	Thermal shutdown temp		-	155	-	℃
T_{SH}	Thermal shutdown hysteresis		-	30	-	℃

TYPICAL PERFORMANCE CHARACTERISTICS

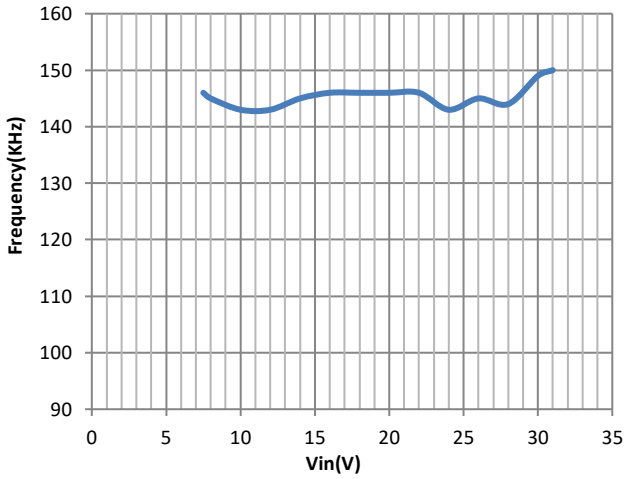
Efficiency vs. Iout (Output1)



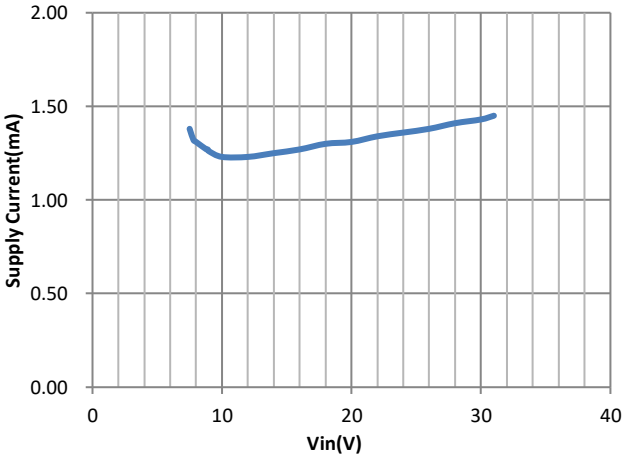
Efficiency vs. Iout (Output2)



Switch Frequency vs. Input Voltage

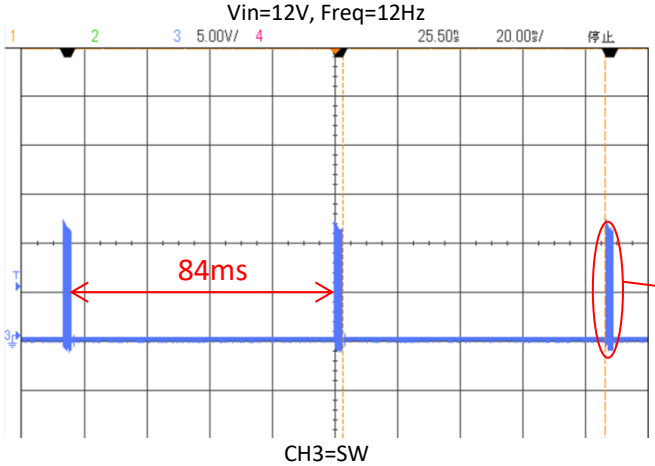


Supply Current vs. Input Voltage



Short Circuit

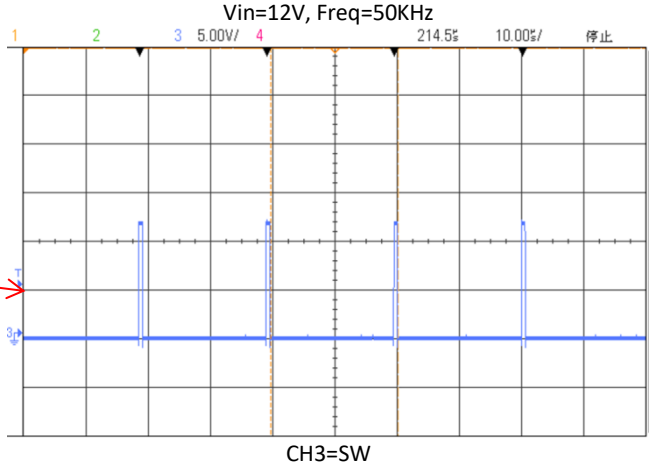
Vin=12V, Freq=12Hz



CH3=SW

Short Circuit

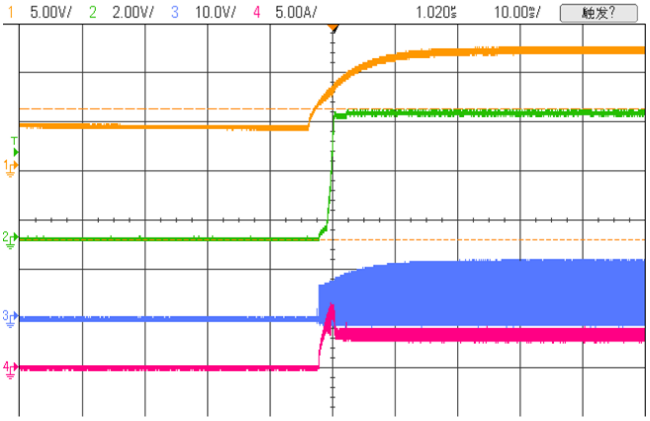
Vin=12V, Freq=50KHz



CH3=SW

Power On

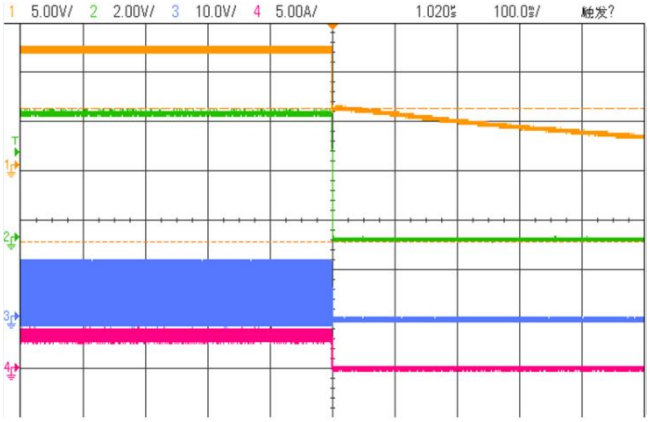
Vin=12V, Vout=5.1V, Iout=3A



CH1=Vin, CH2=Vout, CH3=SW, CH4=Isw

Power Off

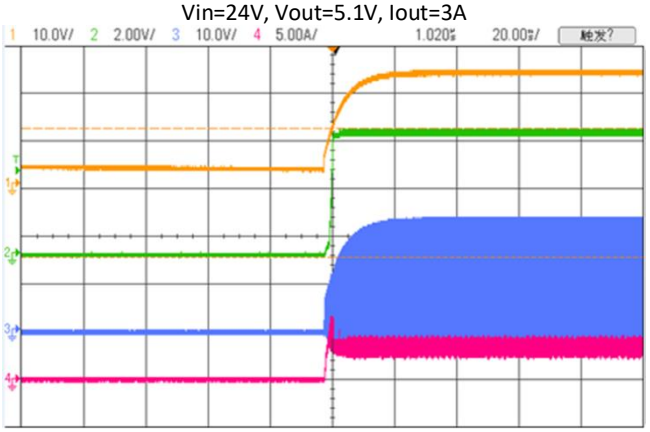
Vin=12V, Vout=5.1V, Iout=3A



CH1=Vin, CH2=Vout, CH3=SW, CH4=Isw

Power On

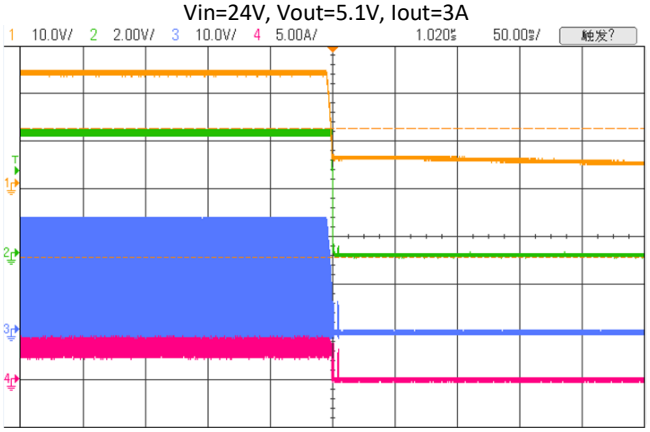
Vin=24V, Vout=5.1V, Iout=3A



CH1=Vin, CH2=Vout, CH3=SW, CH4=Isw

Power Off

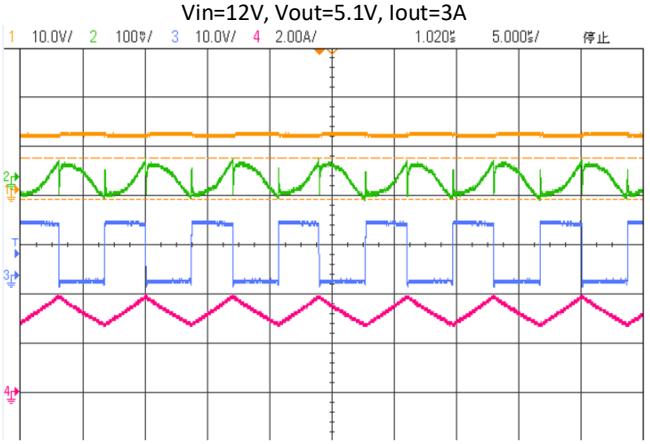
Vin=24V, Vout=5.1V, Iout=3A



CH1=Vin, CH2=Vout, CH3=SW, CH4=Isw

Output Voltage Ripple

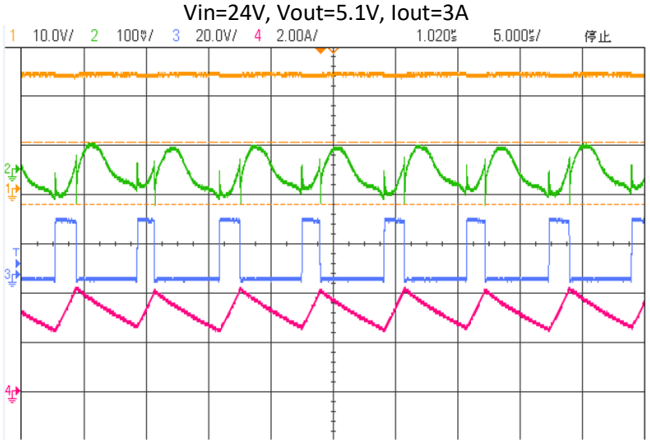
Vin=12V, Vout=5.1V, Iout=3A



CH1=Vin, CH2=Vout_ripple, CH3=SW, CH4=Isw

Output Voltage Ripple

Vin=24V, Vout=5.1V, Iout=3A



CH1=Vin, CH2=Vout_ripple, CH3=SW, CH4=Isw

DETAILED DESCRIPTION

Input under voltage protection

BLL2741Q provides an input voltage up to 35V and operates from an input voltage range of 8.5V to 35V. 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 35V, the UVLO circuit inhibits switching. BLL2741Q will not be damaged until the voltage exceeds 40V. Once VIN drops below 33V, the UVLO clears, and the soft-start sequence activates.

Soft-start

BLL2741Q 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

BLL2741Q presets the output voltage to 5.1V.

Output over voltage protection

Once VSEN rises above 5.1V, BLL2741Q shuts down to avoid damage caused by abnormal use of electrical equipment.

Constant current output

BLL2741Q senses the current by sampling the voltage difference between ISEN1 and ISEN2, and adjusts the output current to the default value by the loop.

$$I_{OUT1} = \frac{50mV}{R_{ISEN1}},\quad I_{OUT2} = \frac{50mV}{R_{ISEN2}}$$

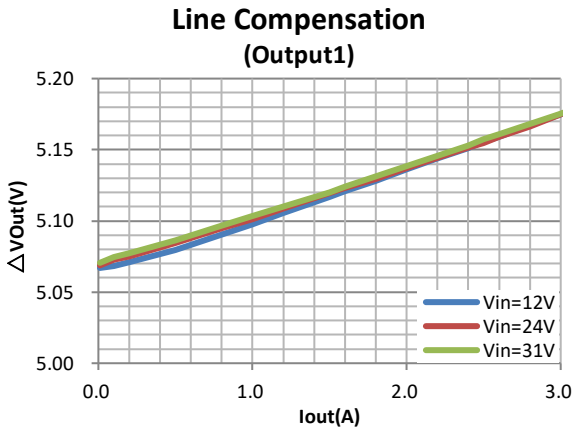
Constant current operates normally when VSEN is higher than 2V. When VSEN is below 1.9V causing by overload, BLL2741Q will enter short circuit protection mode.

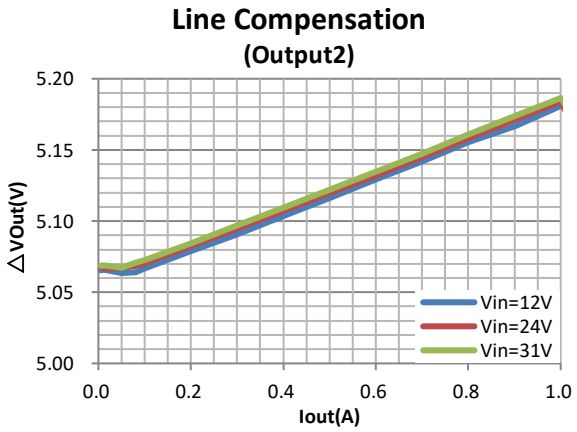
Short circuit protection

When CSN drops below 1.9V since too heavy load, BLL2741Q will enter short circuit protection function, and the system will enter hit-cup mode, and frequency drop to 50KHz per cycle and stop switching for 84ms.

Line compensation

When output current rises from 0mA to full load, Output voltage will be increased 150mV (Typ.) for line compensation.

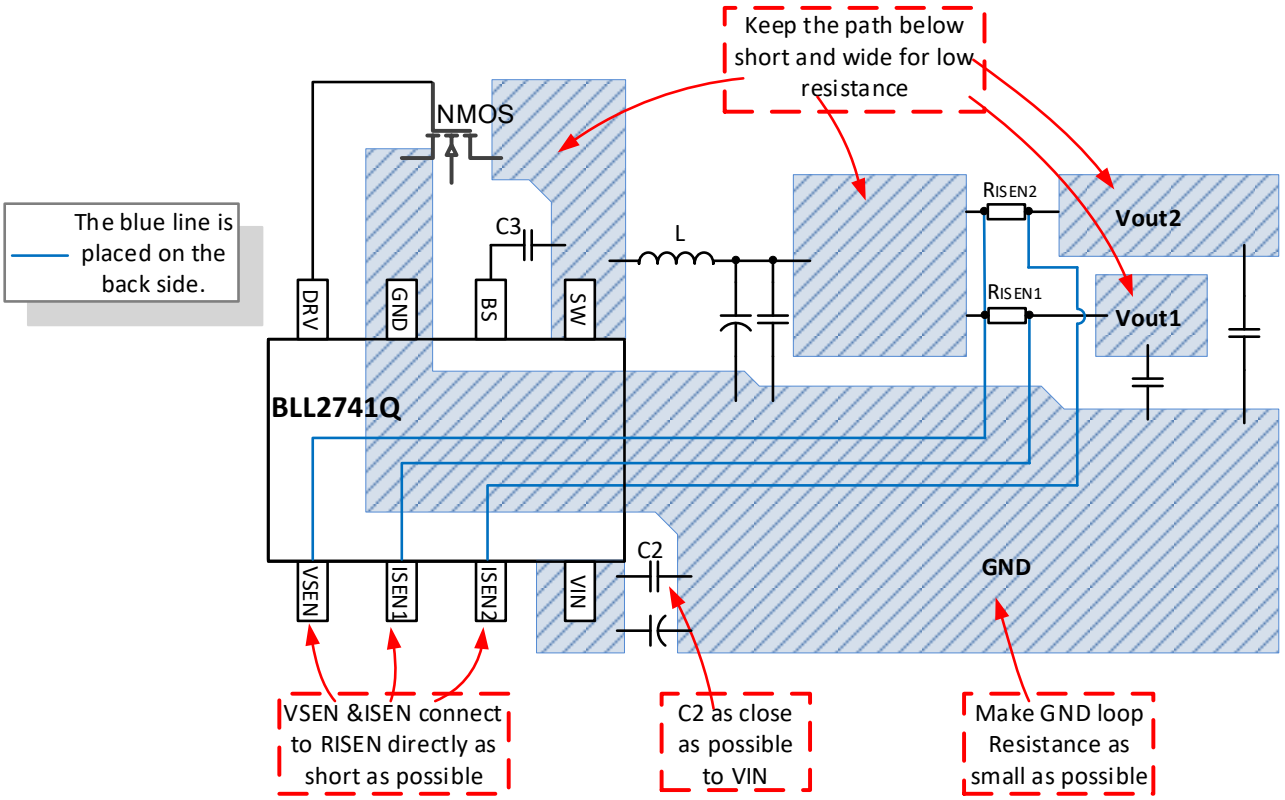


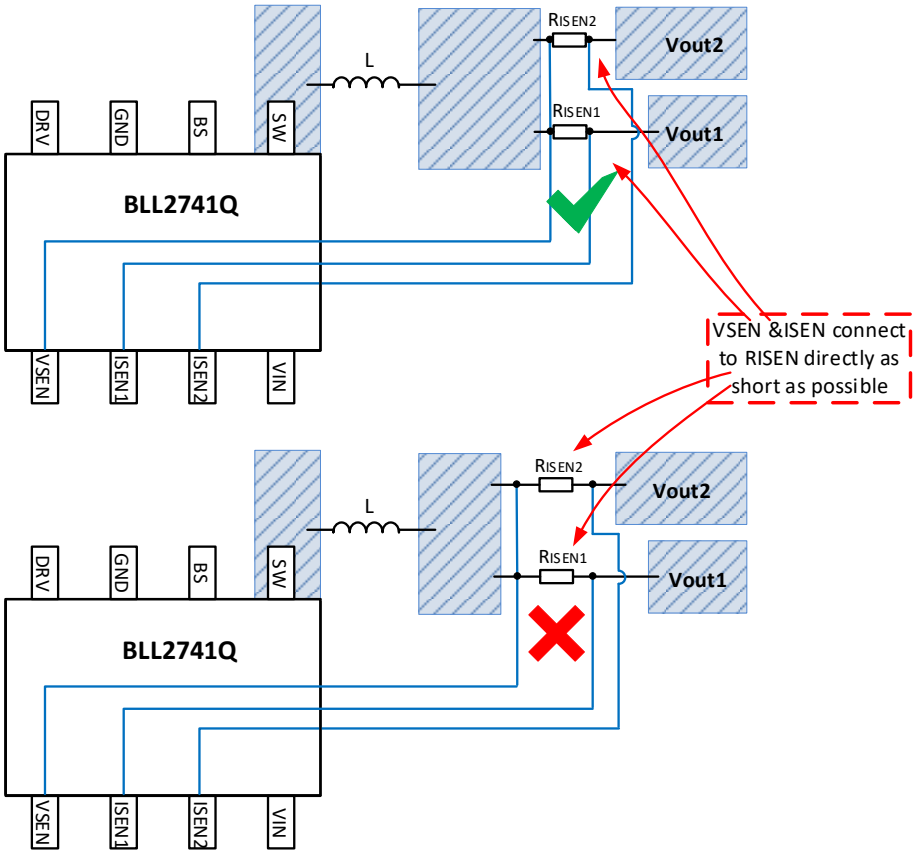


Thermal shutdown

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

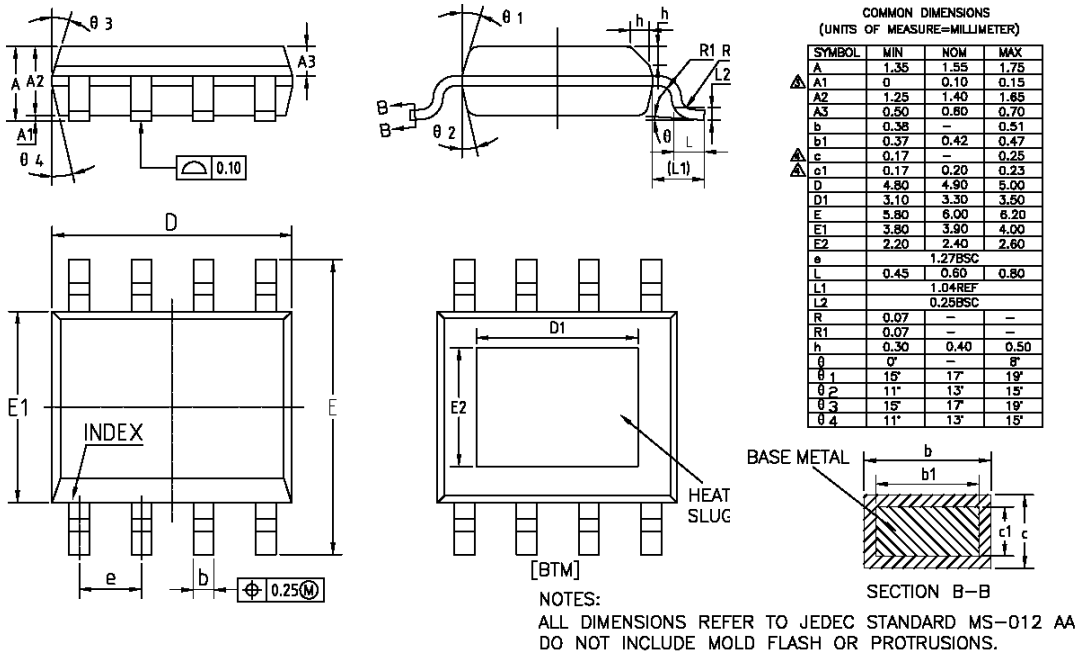




PACKAGE OUTLINE

Package	ESOP-8	Devices per reel	2500pcs

Package specification:



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	1.35	1.55	1.75
A1	0	0.10	0.15
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
D1	3.10	3.30	3.50
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
E2	2.20	2.40	2.60
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°

NOTES:
ALL DIMENSIONS REFER TO JEDEC STANDARD MS-012 AA
DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.

Unit: mm