BL8532B

White LED PFM Step-Up DC-DC Converter

Outline:

The BL8532B is a PFM Step-up DC/DC driver IC with invariant current, design for LED applications. Thought the external resistance, output current reach 0mA~500mA.

A low ripple, high efficiency step-up DC/DC converter can be constructed of BL8532Bxx with only three external components. Also available is a CE (chip enable) function that reduce power consumption

Features:

- Low start voltage：0.8V (at Iout=1mA)；
- Output Current range：0~ 500mA；
- Output Current accuracy：±10%；
- High Efficiency：82%(Type)；
- PACKAGE： SOT-89-5.

Applications：

- Power source for white LED
- Supply constant current
- Power source for a single or dual-cell battery-powered equipments

Selection guide：

BL8532B-*XX X XX*

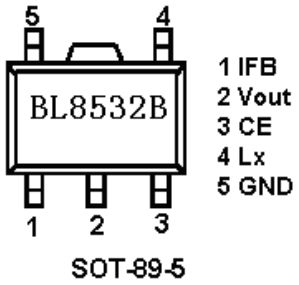
Package:
SN：SOT-89-5

Temperature range:
C：standard
P：standard
（Pb free）

Feedback voltage:
10……100mV
20……200mV
25……250mV
30……300mV
35……350mV
40……400mV

Pin configuration：

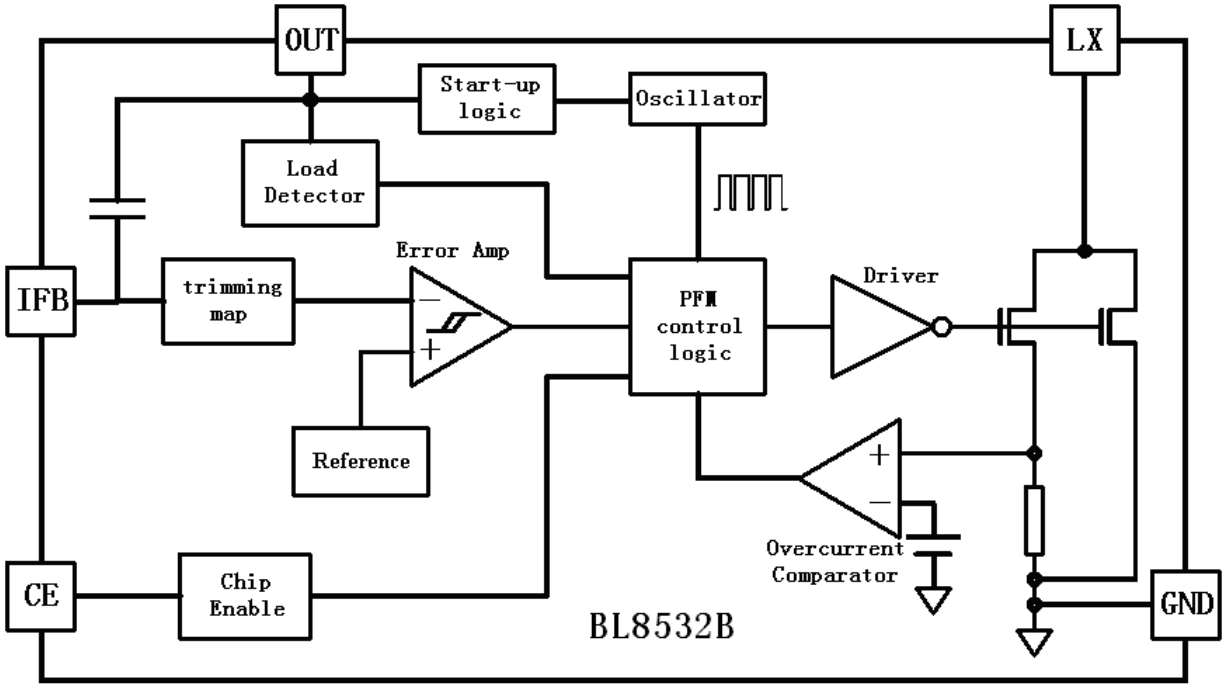
BL8532B-☐☐PSN



SOT-89-5

Pin No.	Symbol	**Description**
1	IFB	Current feedback pin
2	Vout	Output pin, power supply for internal circuits
3	CE	Chip enable pin (active high)
4	Lx	Switching pin(Nch open drain)
5	GND	Ground pin

Functional block diagram：



Absolute maximum ratings:

PARAMETER		SYMBAL	RATINGS	UNITS
VIN Input Voltage		VIN	0.3~9	V
Lx Pin voltage		VLX	0.3~Vout+0.3	V
CE Pin voltage		VCE	0.3~Vout+0.3	V
IFB output voltage		VIFB	0.3~Vout+0.3	V
Lx Pin current		ILX	1.5	mA
Continuous Total Power Dissipation	SOT-23-5	Pd	300	mW
	SOT-89-5	Pd	500	mW
Maximum Operating Ambient Temperature		Tmax	150	℃
Operating Ambient Temperature		TOpr	-20~+85	℃
Storage Temperature		Tstg	-40~+125	℃
Soldering temperature and time		Tsolder	260℃, 10s	

Recommended operating conditions:

	MIN	NOM	MAX	UNIT
Input voltage range	0.8		Vout	V
inductor	10	15	100	μH
Input capacitor	0	≥22		μF
Output capacitor*	47	100	220	μF
Operating junction temperature	-20		85	℃

Electrical characteristics:

(Vin＝2.5V， V_{CE}=Vout＝3.3V，R＝33Ω，T_A=25°C, unless otherwise noted.)

Symbol	Item	Test conditions	Min	Typ.	Max	Unit
VOUT	feedback Voltage	IOUT=100mA	90	100	110	mV
			180	200	220	
Vstart	Starup Voltage	IOUT=1mA, VIN：0→2V		0.8	0.9	V
Vhold	holding Voltage	IOUT=1mA, VIN：2→0V	0.6	0.9		V
IDD2	Supply Current	LX empty, VCE=VIFB=VOUT=3.3 V		36		μA
ILX	Lx Switching Current	VLX=0.4V, VIFB=0	700			mA
ILXleak	Lx Leakage Current	VOUT=VLX=VIFB=6V			1	μA
Ileak	CE is “L”, Leakage Current of the chip	VOUT=3.3V, VCE=0, LX, IFB empty		<0.1	0.5	μA
Fosc	Oscillation Frequency	VIFB=0		300		kHz
Maxdty	Duty Ratio	On(VLX “L”)side	77	79	82	%
η	Efficiency	IOUT=250mA		82		%
VCEH	CE is “H”,input voltage	VCE：0→2V (up to work slowly with the chip)	0.6	0.9		V
VCEL	CE is “L”,input voltage	VCE：0→2V (down to work off slowly with the chip)		0.3	0.6	V
IOM	Maximum output diver power	VIFB =0, VOUT =3.3V		500		mA

Note:

1、Diode：Schottky diode（forward voltage drop： 0.3V，0.3A），such as IN5817 or 1N5819

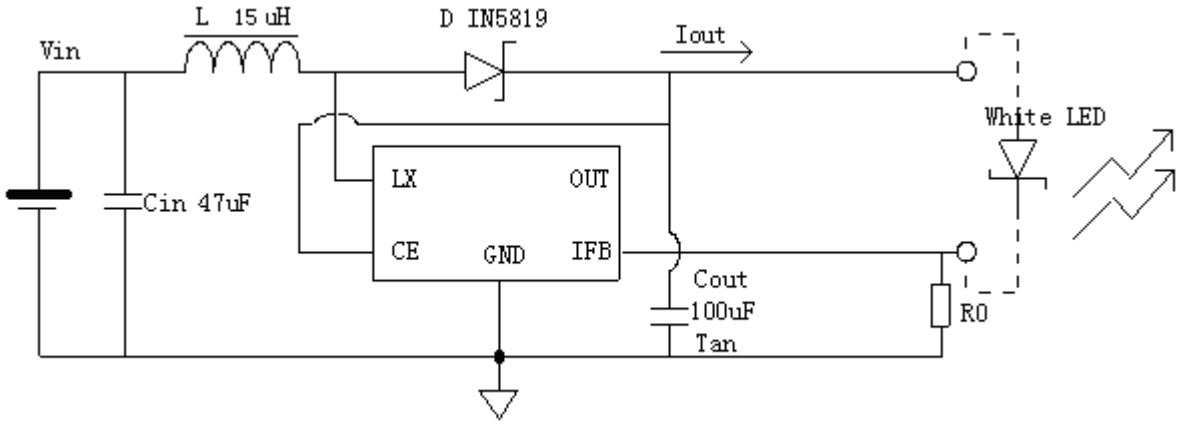
2、Inductor：15μH（R<0.5Ω）

3、Capacitor：100μF （Tantalum type ）

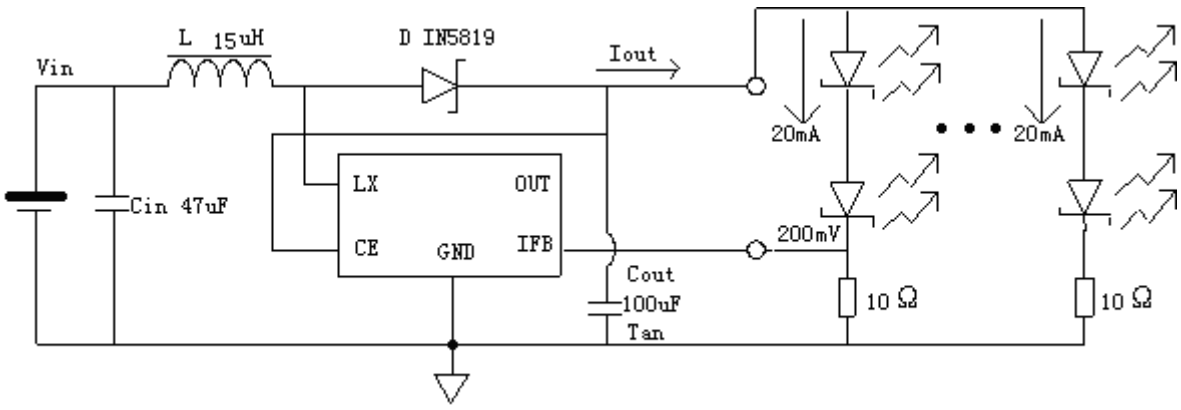
4、VIFB (SET) is feedback voltage of the chip set up , is the first parameter of the table ,such as 100mV、200mV and so on。

Typical applications:

Constant output current application



(A) Drive only one white LED



(B) Drive two white-LED in series and several in parallel connection

Suggestions:

1. you can increase the output capacitor properly for improve to the characteristic of the output invariant current (for example：150uF or 200uF).
2. to avoid the feedback voltage excursion, please wear the ring with static electricity and the electric iron connect to ground when the soldering

Detailed description:

The BL8532B is a DC/DC step-up converter with voltage type , PFM control mode , output invariablenes current. It has only three Peripheral components that is a inductor 、a output capacitor、a schottky diode and a resistor with set-up output current, that can afford to a invariant output current between 0 and 500mA .

Rc set-up method：

If the output current is Iout，that Rc=$V_{IFB}/Iout$ 。

For example, want to the current value of 100mA , select the chip of VIFB=200mV, that Rc=200mV/100mA=2Ω。

Selection of the external components:

Thus it can be seen, the inductor and shottky diode affect the conversion efficiency greatly. The inductor and the capacitor also have great influence on the output voltage ripple of the converter. So it is necessary to choose a suitable inductor, a capacitor and a right shottky diode, to obtain high efficiency, low ripple and low noise.

Before discussion，we define: $D \equiv \frac{Vout - Vin}{Vout}$.

（1）Inductor Selection

Make sure DC-DC can natural work firstly in the model of the minimum continuous current that is Lmin，Lmin$\geqq \frac{D(1-D)^2 R_L}{2f}$.

This formula deduce that ignoring the autoecious resistor and a diode with the forward voltage drop, but the actual value is still big. If the inductance less than Lmin, inductor will reach magnetic saturation, efficiency will greatly drop, and hardly output steady voltage.

Secondly , considering the current ripple of the inductor, ignoring the autoecious parameter in the mode of continuous current.

$\Delta I = \frac{D \bullet Vin}{Lf}$ ， $Imax = \frac{Vin}{(1-D)^2 R_L} + \frac{DVin}{2Lf}$.

When “L” is too small, will lead to high current ripple of the inductor , and the maximum current of the inductor , schottky diode , power tube of the chip are excessive .

Thirdly, generally speaking, not considering efficiency , small inductor can drive load more then large inductor .But in the same load conditions , large inductor with the current ripple and the maximum current value are small. So the large inductor should be able to start up circuit in the low input voltage.

Use inductor with an inductance of 10μH or more ,it’s ensure to normal work . If output port has load with output large current (for example: output current is more than 50mA), for improving to efficiency, suggest to use large inductor. At the same time, in the large load, the resistor is in series with the inductor that will affect the switching efficiency. Supposed , the resistor is rL，Rload，that the power consumption as follow：

$\Delta\eta \approx \frac{r_L}{R_{load}(1-D)^2}$

For example, input 1.5V, output 3.0V, load 20 Ω (150mA),rL=0.5Ω,efficiency loss 10% . Considering, suggest to use an inductance of 15 uH , <0.5Ω.

（2）Capacitor Selection

No considering the inductor with equivalent series resistor(ESR), output voltage ripple is：

$$r=\frac{\Delta Vout}{Vout}=\frac{D}{R_{load}Cf}$$

considering the inductor's ESR, the output ripple will be increase：

$$r'=r+\frac{\mathrm{Im}ax\bullet R_{ESR}}{Vout}$$

Suggest to use Tantalum type with the low ESR or more parallel-resistor.

（3）Diode Selection

It is recommended that the diode have great effect to DC-DC efficiency, we suggest to use schottky diode with the lower positive turn-on voltage and the lower corresponsive time. For example, 1N5817、1N5819 .

（4）Input Capacitor

Power supply is stably, even if no input capacitor, DC-DC can output voltage with the lower ripple and the lower noise. But we suggest to connect with the capacitor of 10uF or more when the power supply was far away DC-DC, for minish the output noise.

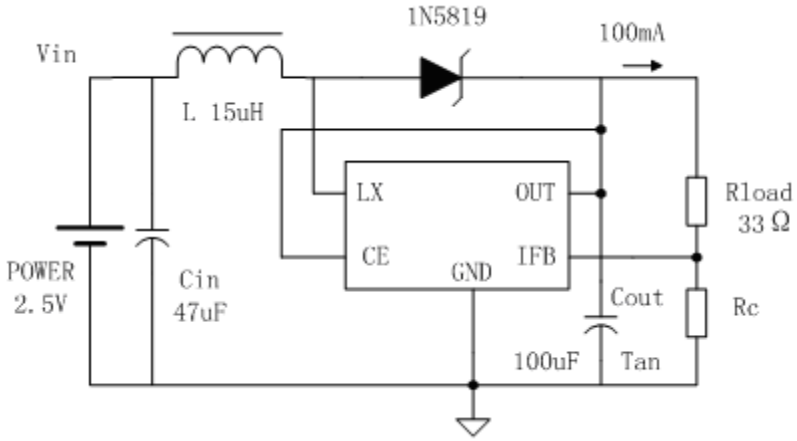
（5）Resistor R1、R2 for output voltage detect

Application to invariant current , the formula of R1、R2：

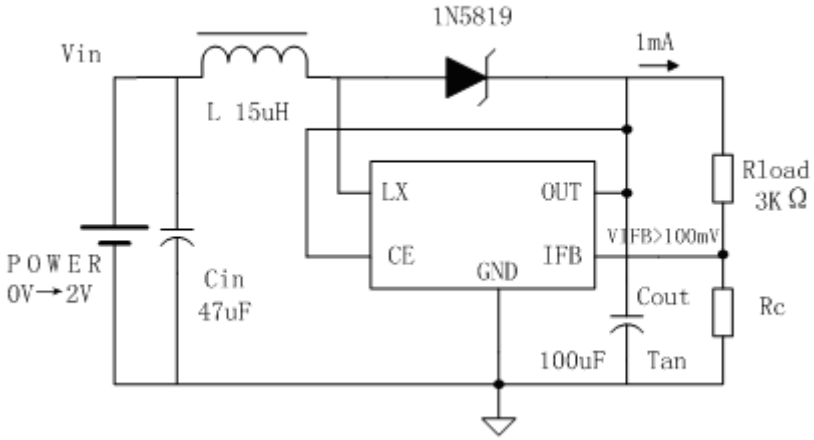
$$\frac{Vout}{V_{IFB}}=\frac{R1}{R2}+1$$

Test circuits:

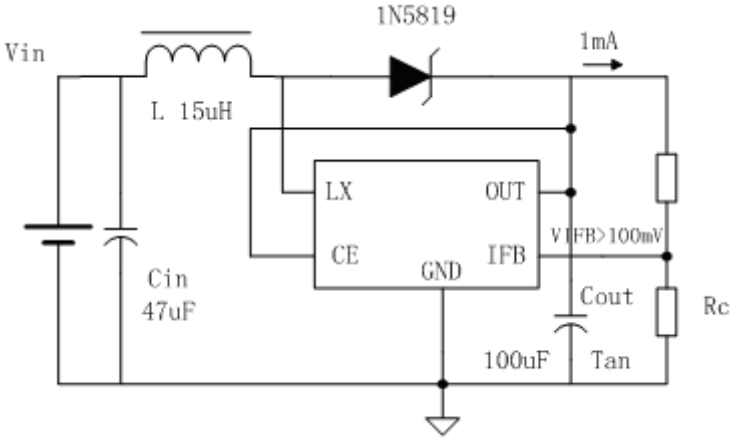
(1) Feedback voltage test circuit



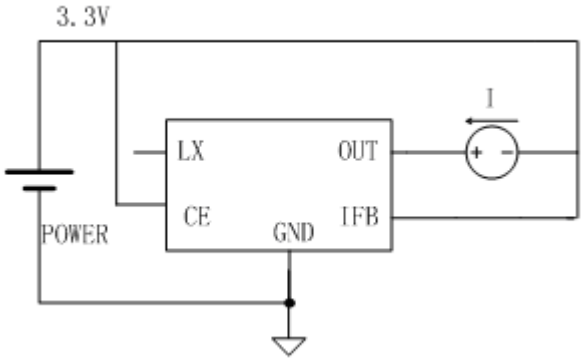
(2) Start-up voltage test circuit（I_{load}=1mA）



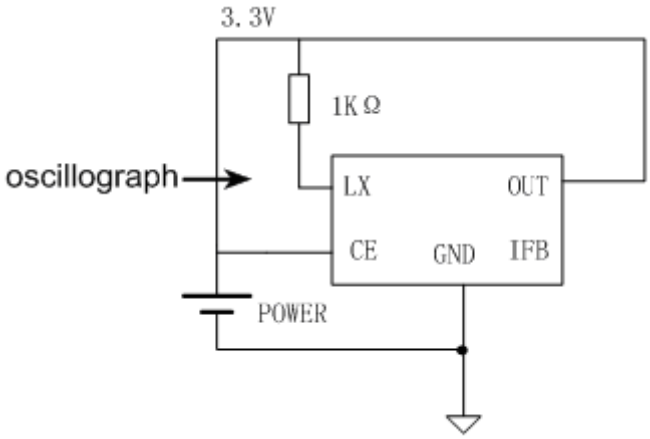
(3) Hold-on voltage test circuit（I_{load}=1mA）



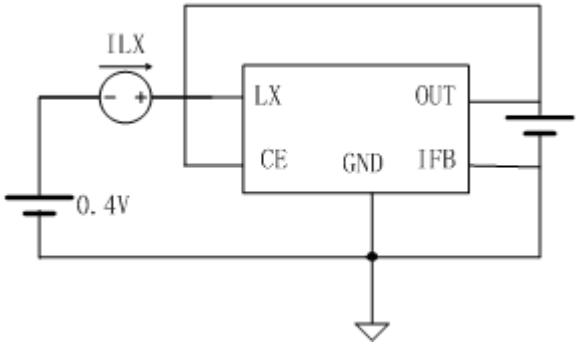
(4) Quiescent current test circuit



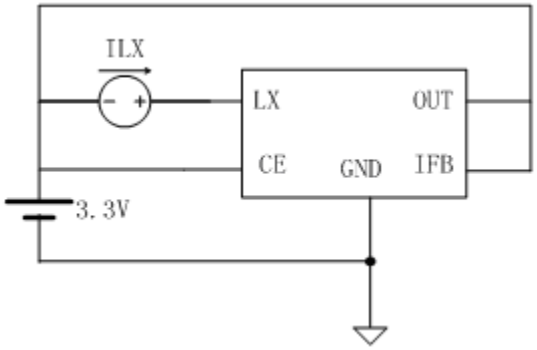
(5) Oscillator frequency and duty cycle test circuit



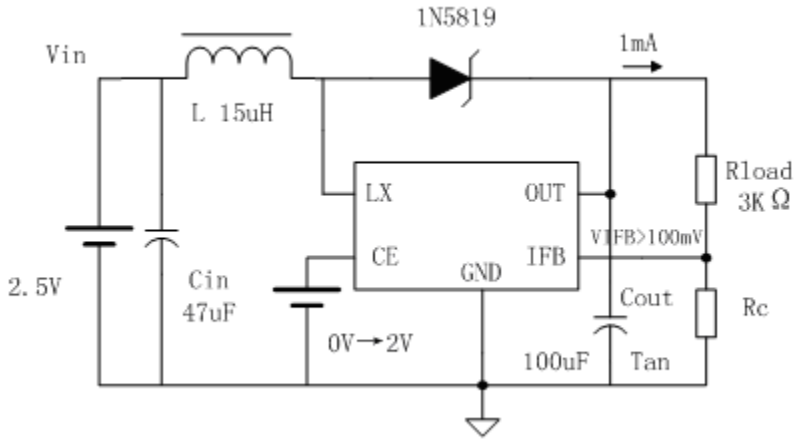
(6) LX switching current test circuit



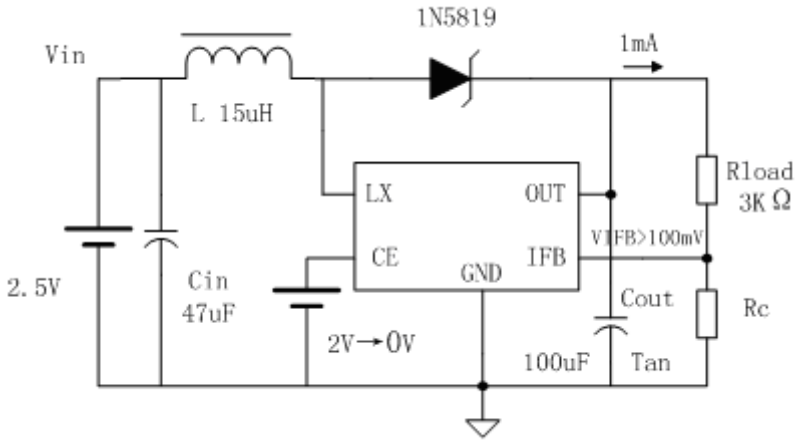
(7) LX leakage current test circuit



(8) CE “H” voltage test circuit

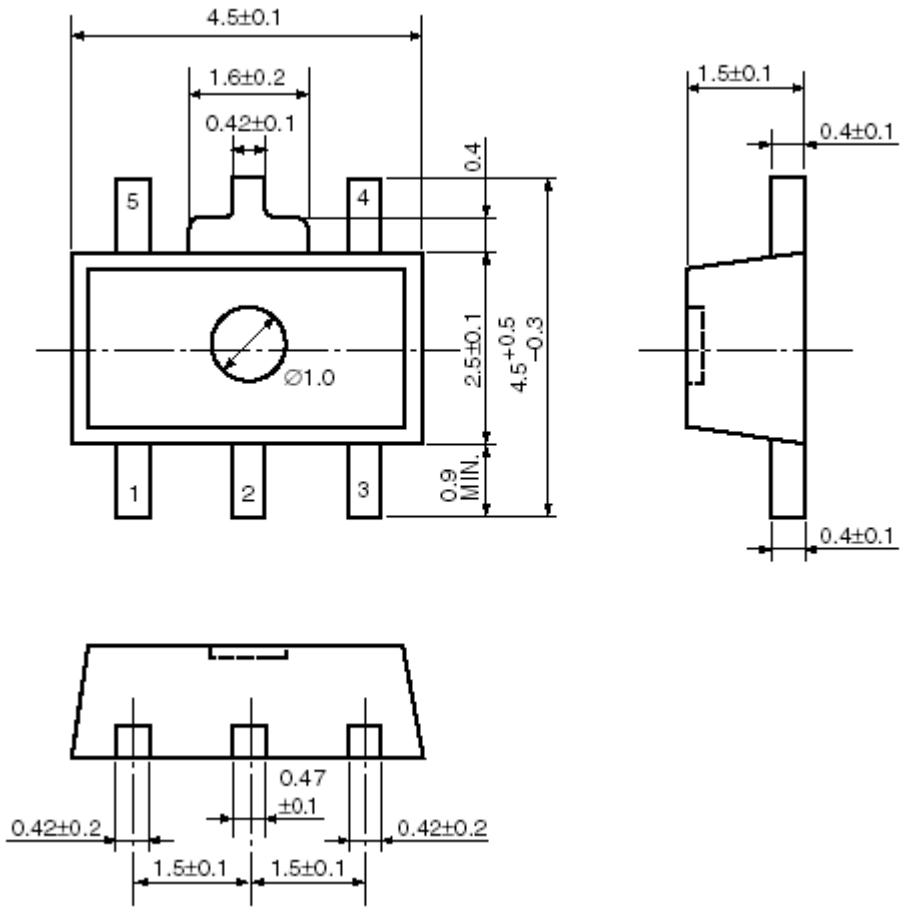


(9) CE “L” voltage test circuit

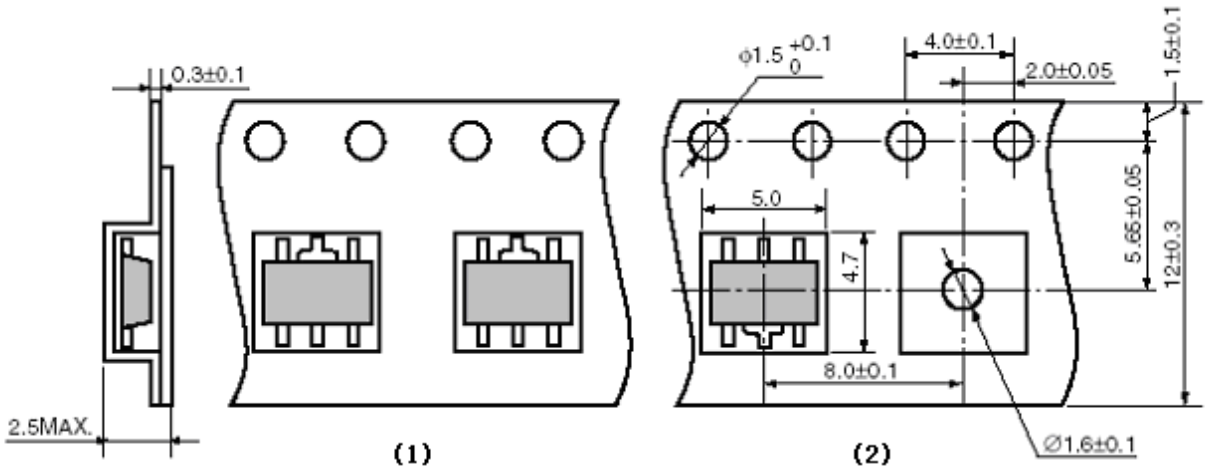


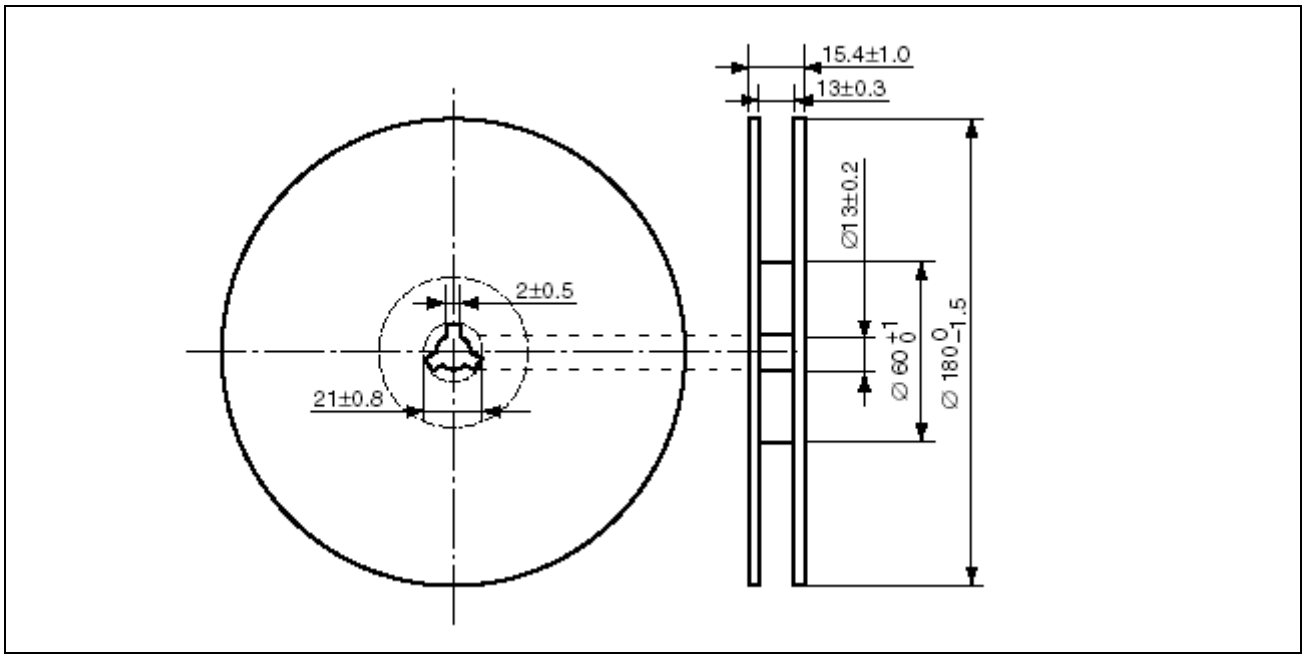
Package description:

Package	SOT-89-5	Number of each volume	1000	Unit	mm



Brede size：
Mode (1) is the standard package;
Mode (2) is customized for client.




15.4±1.0
13±0.3
Ø13±0.2
2±0.5
21±0.8
Ø 60 +1 0
Ø 180 0 -1.5