2A, 23V, 380KHz
Step-Down Converter

GENERAL DESCRIPTION

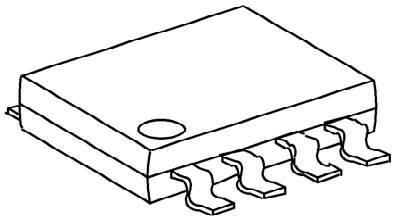
The **FP6185** is a buck regulator with a built in internal power MOSFET. It achieves 2A continuous output current over a wide input supply range with excellent load and line regulation. Current mode operation provides fast transient response and eases loop stabilization. The device includes cycle-by-cycle current limiting and thermal shutdown protection. Adjustable soft-start reduced the stress on the input source at power-on. The regulator only consumes 23μA supply current in shutdown mode. The FP6185 requires a minimum number of readily available external components to complete a 2A buck regulator solution.

FEATURES

- 2A Output Current
- Adjustable Soft-Start
- 0.18Ω Internal Power MOSFET Switch
- Stable with Low ESR Output Ceramic Capacitors
- Up to 95% Efficiency
- 23μA Shutdown Mode Current
- Fixed 380KHz frequency
- Thermal Shutdown
- Cycle-by-Cycle Over Current Protection
- Wide 4.75 to 23V operating Input Range
- Output Adjustable From 0.92 to 16V
- Available SOP8
- Under Voltage Lockout

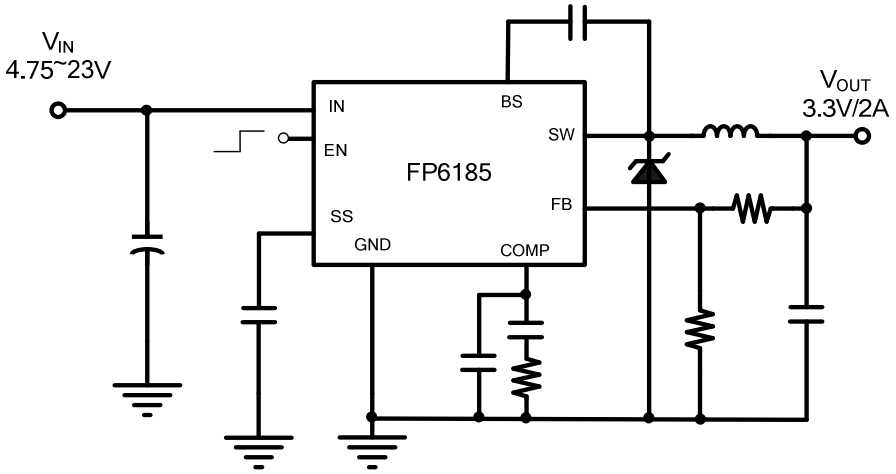
APPLICATIONS

- Distributed Power Systems
- Battery Charger
- Pre-Regulator for Linear Regulators
- DSL Modems

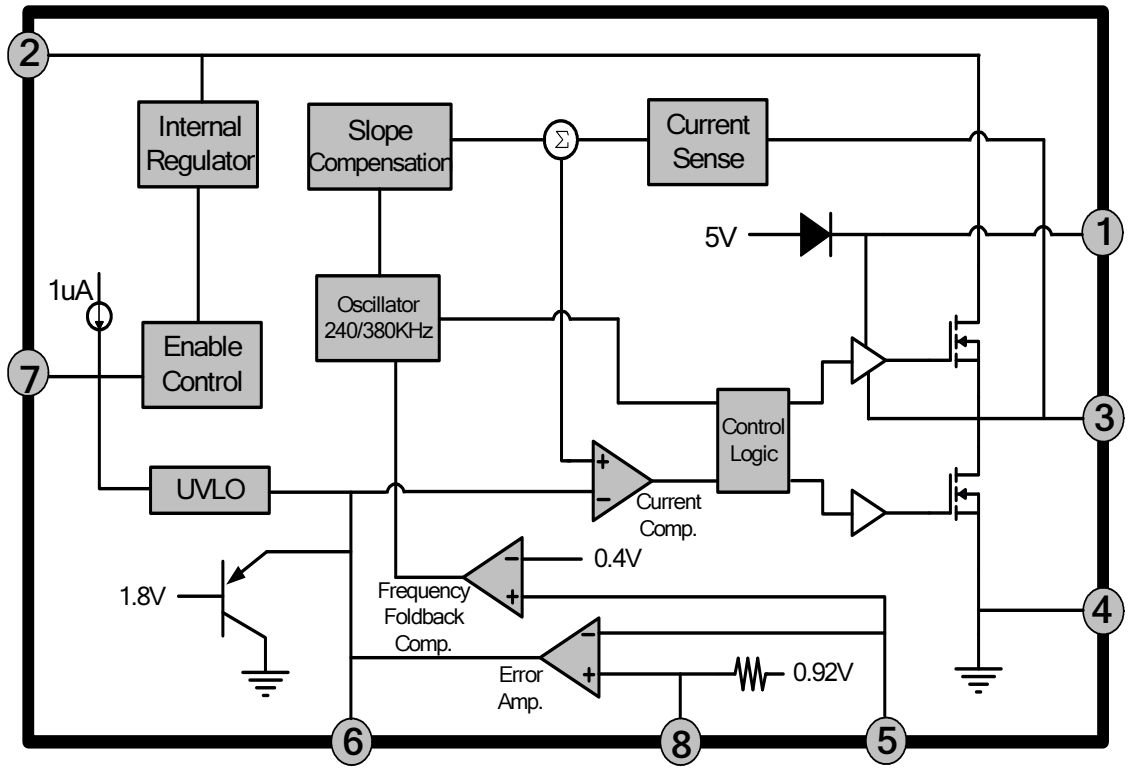


SOP8

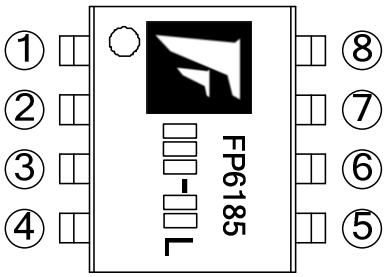
TYPICAL APPLICATION CIRCUIT



FUNCTIONAL BLOCK DIAGRAM



MARK VIEW



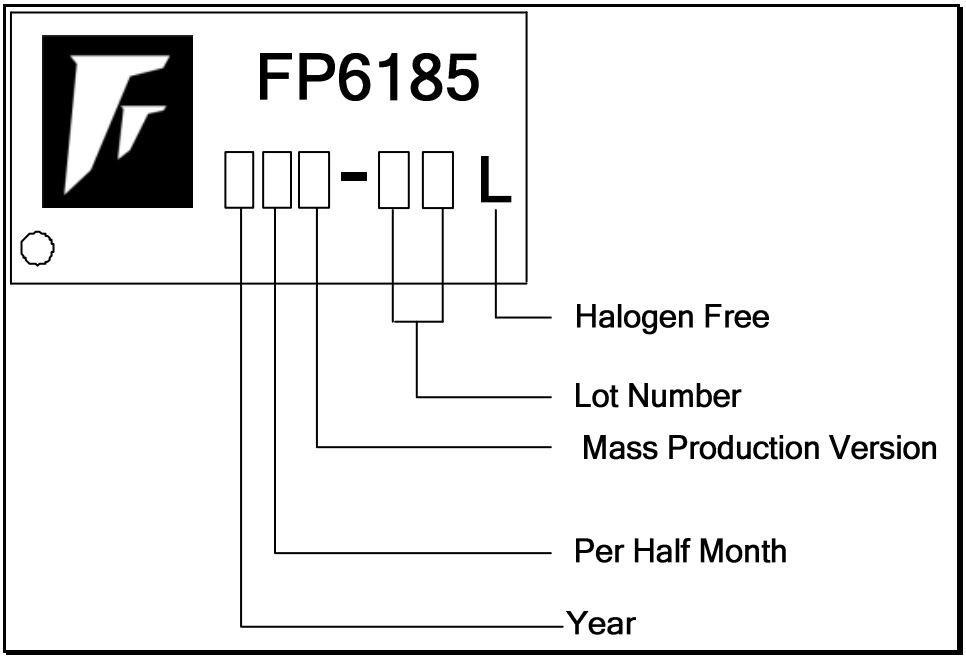
PIN DESCRIPTION

Name	No.	I/O	Description
BS	1	O	Bootstrap Pin
IN	2	P	Supply Voltage
SW	3	O	Switch Pin
GND	4	P	Ground
FB	5	I	Feedback Pin
COMP	6	O	Compensation Pin
EN	7	I	Enable/UVLO
SS	8	O	Programmable Soft Start

ORDER INFORMATION

Part Number	Operating Temperature	Package	Description
FP6185D-G1	-40℃ ~ +85℃	SOP8	Tube
FP6185DR-G1			Tape & Reel

IC DATE CODE DISTINGUISH



For example:

1 – Year 2001

2 – Year 2002

3 – Year 2003 --------- And so on

Lot Number is the last two numbers

For example:

A3311C62

Lot Number

ABSOLUTE MAXIMUM RATINGS

Supply Voltage (V_{IN}) ..... –0.3V to 24V

Switch Voltage (V_{SW}) ..... $-1V_{IN}$ to 0.3V

Bootstrap Voltage (V_{BS}) ..... V_{SW}–0.3V to V_{SW}+6V

All Other Pins ..... –0.3V to 6V

Junction Temperature ..... 150℃

Storage Temperature ..... –65℃ to 150℃

Allowable Power Dissipation (Ta≦+25℃)

SOP8 ..... 570mW

Thermal Resistance

Junction to Ambient,θ_{JA}

SOP8 ..... 175℃/W

Junction to Case,θ_{Jc}

SOP8 ..... 50℃/W

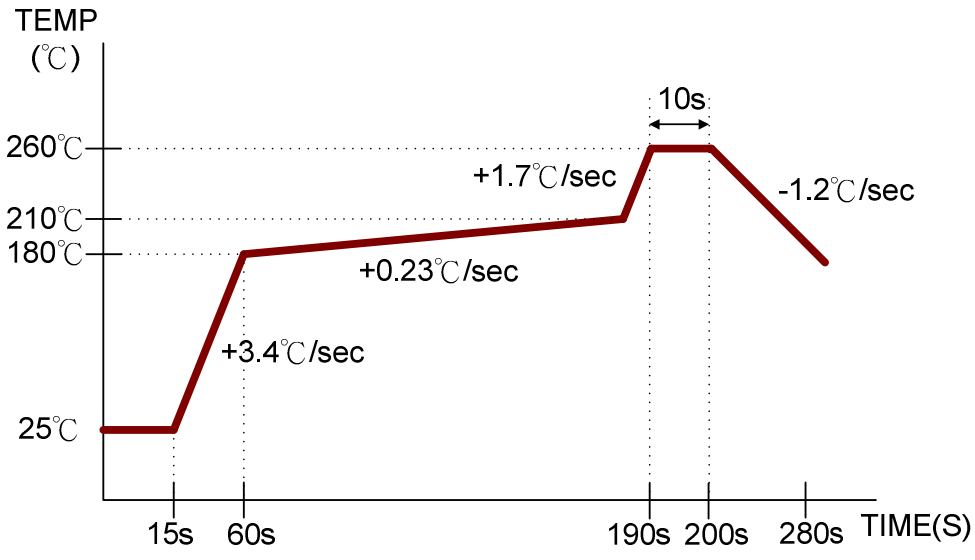
Operating temperature ..... –40℃～+85℃

Lead Temperature (soldering, 10 sec) ..... +260℃

Recommended Operating Conditions

Supply Voltage (V_{IN}) ..... 4.75~23V

Operating temperature ..... –40℃～+85℃



IR Re-flow Soldering Curve

Note:

1. Suggest IR Reflow Soldering Profile Condition.

DC ELECTRICAL CHARACTERISTICS(Ta= 25℃, V_{IN}=12V, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Standby Current	I_{ST}	V_{EN}≧3V,V_{FB}>1V	0.3	0.5	0.7	mA
Operating Current	I_{CC}	V_{EN}≧3V	3.2	4.2	6.1	mA
Shutdown Supply Current	I_{ST}	V_{EN}=0	15	24	36	μA
Feedback Voltage	V_{FB}	V_{IN}=12V,V_{COMP}<2V	0.892	0.920	0.948	V
Current Sense Transconductance Output Current to Comp Pin Voltage	T_{CS}			2.1		A/V
Error Amplifier Voltage Gain	G_{EA}			400		V/V
Error Amplifier Transconductance	T_{EA}	△IC=±10μA		830		μA/V
High Side Switch ON Resistance	R_{ON-HS}			0.18		Ω
Low Side Switch ON Resistance	R_{ON-LS}			10		Ω
High Side Switch Leakage Current	I_{IL}	V_{EN}=0,V_{SW}=0V		0.1	10	μA
Current Limit	I_{CL}			3.4		A
Oscillation Frequency	f_{OSC}			380		KHz
Short Circuit Oscillation Frequency	f_{SC}	V_{FB}=0V		240		KHz
Maximum Duty Cycle	D_{MAX}	V_{FB}=0.8V		90		%
Minimum On Time	t_{ON}	V_{FB}=1.5V		100		ns
Under Voltage Lockout Threshold	V_{UVLO}		2.37	2.50	2.62	V
Under Voltage Lockout Threshold Hysteresis	V_{HYS}			210		mV
EN Threshold Voltage	V_{EN}	ICC＞100μA	0.7	1.0	1.3	V
Enable Pull Up Current	I_{EN}	V_{EN}=0V		1.0		μA
Soft-Start Pin Equivalent Output Resistance	R_{SS}			9		kΩ
Thermal Shutdown	T_{TS}			150		℃
Thermal Shutdown Reset Hysteresis	T_{HYS}			40		℃

Function Description

The FP6185 is a current-mode buck regulator. It regulates input voltages from 4.75V to 23V down to an output voltage as low as 0.92V, and is able to supply up to 2A of load current.

The FP6185 uses current-mode control to regulate the output voltage. The output voltage is measured at FB through a resistive voltage divider and amplified through the internal error amplifier. The output current of the transconductance error amplifier is presented at COMP where a network compensates the regulation control system. The voltage at COMP is compared to the switch current measured internally to control the output voltage.

The converter uses an internal n-channel MOSFET switch to step-down the input voltage to the regulated output voltage. Since the MOSFET requires a gate voltage greater than the input voltage, a boost capacitor connected between SW and BS drives the gate.

The capacitor is internally charged while the switch is off. An internal 10Ω switch from SW to GND is used to insure that SW is pulled to GND when the switch is off to fully charge the BS capacitor.

Output Voltage(V_{OUT})

The output voltage is set using a resistive voltage divider from the output voltage to FB. The voltage divider divides the output voltage down by the ratio:

VFB=VOUT x R2/(R1+R2)

Thus the output voltage is:

VOUT=0.92 x (R1+R2)/R2

A typical value for R2 can be as high as 100k, but a typical value is 10K.

Shutdown Mode

Drive enable Pin to ground to shut down the FP6185. Shutdown forces the internal power MOSFET off, turns off all internal circuitry, and reduces the V_{IN} supply current to 20μA (typ). The enable Pin rising threshold is 1.0V(typ). Before any operation begins, the voltage at Enable Pin must exceed 1.0V (typ). The Enable Pin input has 100mV hysteresis.

Boost High-Side Gate Drive(BST)

Since the MOSFET requires a gate voltage greater than the input voltage ,connect a flying bootstrap capacitor between SW and BS to provide the gate-drive voltage to the high-side n-channel MOSFET switch. The capacitor is alternately charged from the internally regulator.

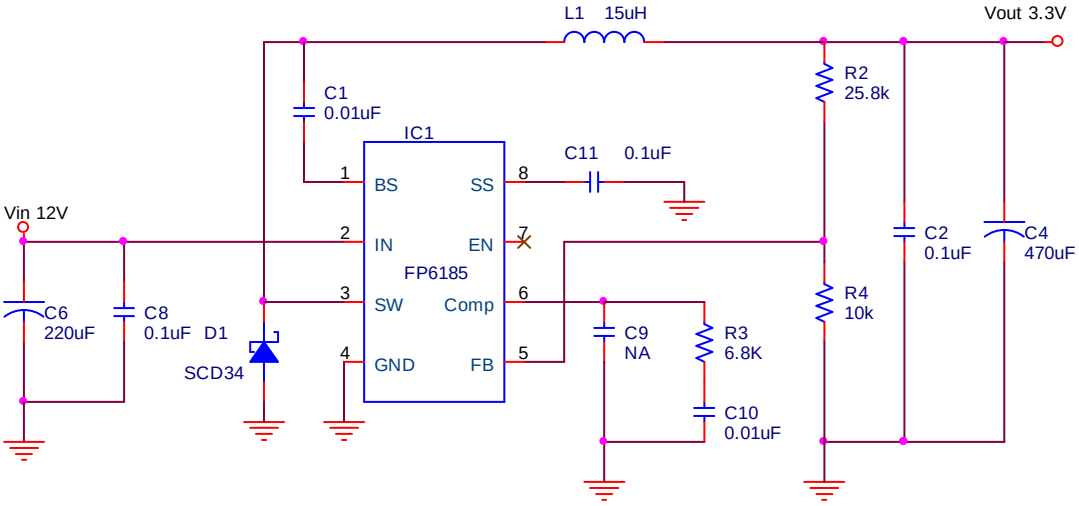
On startup, an internal low-side switch connects SW to ground and charges the BST capacitor to internally regulator voltage. Once the BST capacitor is charged, the internal low-side switch is turned off and the BST capacitor voltage provides the necessary enhancement voltage to turn on the high-side switch.

Function Description(cont.)

Thermal Shutdown Protection

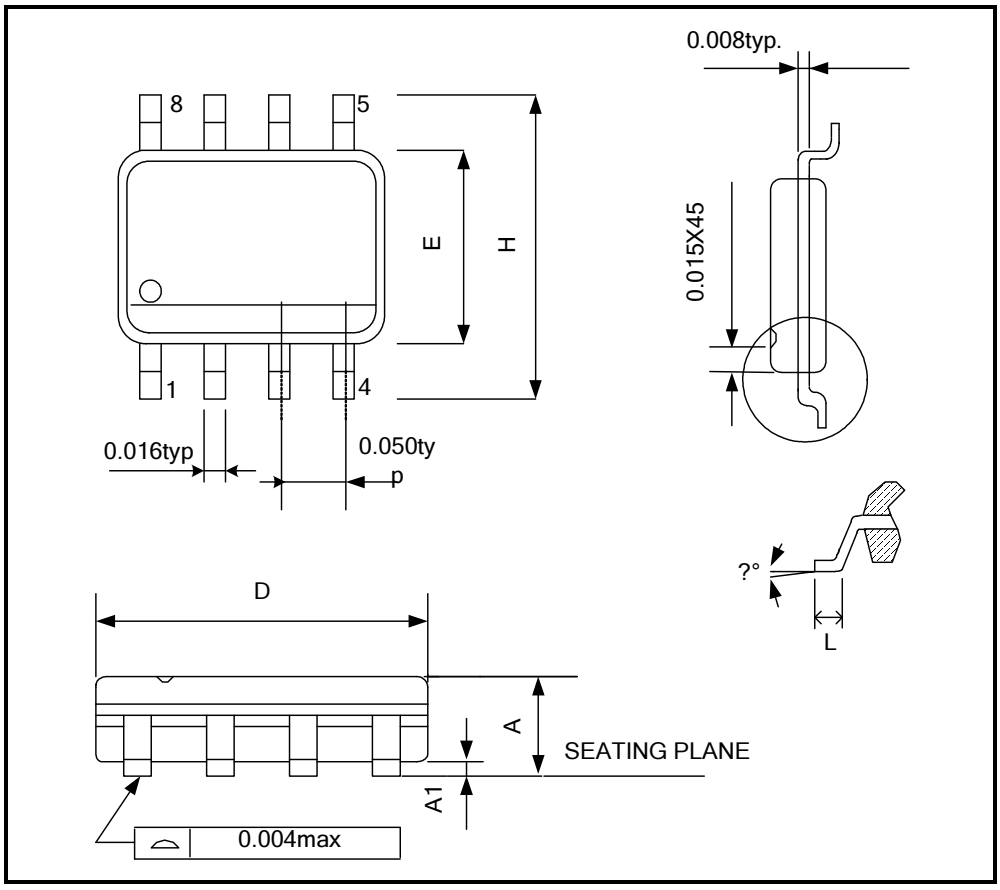
The FP6185 features integrated thermal shutdown protection. Thermal shutdown protection limits allowable power dissipation(P_D) in the device, and protects the device in the event of a fault condition. When the IC junction temperature exceeds +150℃, an internal thermal sensor signals the shutdown logic, turning off the internal power MOSFET and allowing the IC to cool down. The thermal sensor turns the internal power MOSFET back on after the IC junction temperature cools down to + 110℃, resulting in a pulsed output under continuous thermal overload conditions.

APPLICATIONS INFORMATION



PACKAGE OUTLINE

SOP8



SYMBOLS	MIN	MAX
A	0.053	0.069
A1	0.004	0.010
A2	-	0.059
D	0.189	0.196
E	0.150	0.157
H	0.228	0.244
L	0.016	0.050
θ °	0	8

UNIT:INCH

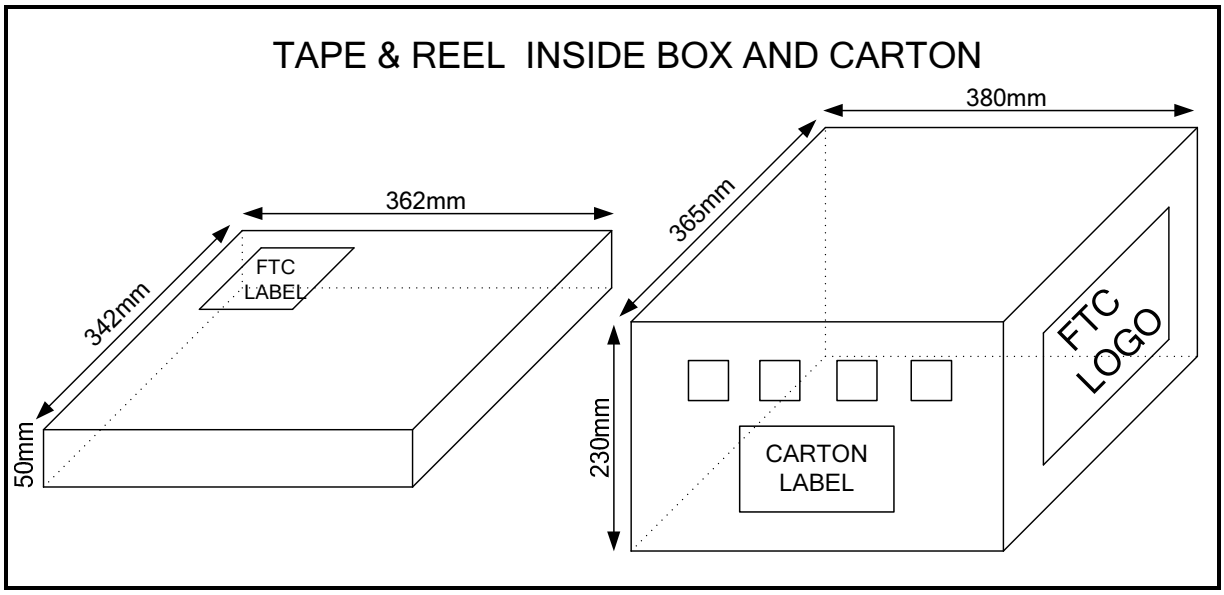
NOTE:

1. JEDEC OUTLINE:MS-012 AA。
2. DIMENSIONS “D” DOES NOT INCLUDE MOLD FLASH,PROTRUSIONS OR GATE BURRS.MOLD FLASH,PROTRUSIONS AND GATE BURRS SHALL NOT EXCEED .15mm (.006in) PER SIDE。
3. DIMENSIONS “E” DOES NOT INCLUDE INTER-LEAD FLASH,OR PROTRUSIONS INTER-LEAD FLASH AND PROTRUSIONS SHALL NOT EXCEED .25mm (.010in) PER SIDE。

PACKING SPECIFICATIONS

BOX & CARTON DIMENSION

SOP8

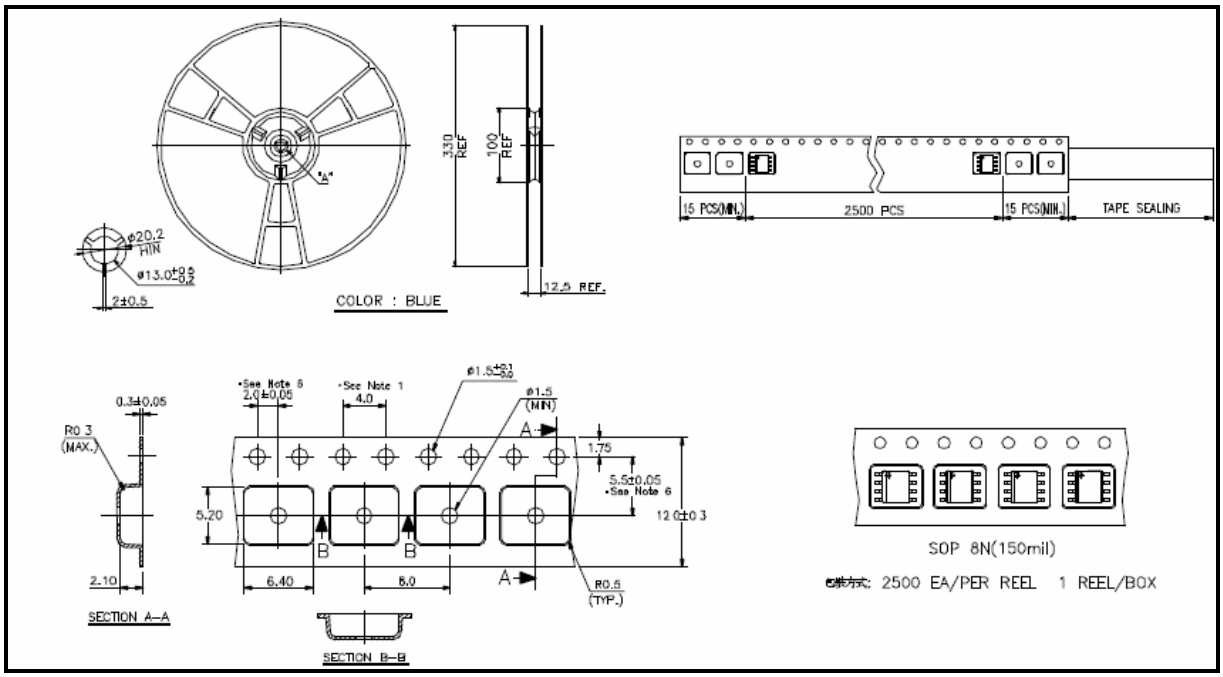


PACKING QUANTITY SPECIFICATIONS

SOP8
2500 EA / REEL
1 REELS / INSIDE BOX
4 INSIDE BOXES / CARTON

CARRIER TAPE AND REEL DIMENSIONS

SOP8



Note:

1. 10 SPROCKET HOLE PITCH CUMULATIVE TOLERANCE ±0.2mm.
2. COMBER NOT TO EXCEED 1mm IN 100mm.
3. MATERIAL：ANTI-STATIC BLOCK ADVANTEK POLYSTYRENE.
4. A_0 AND B_0 MEASURED ON A PLANE 0.3mm ABOVE THE BOTTOM OF THE POCKET.
5. K_0 MEASURED FROM A PLANE AN THE INSIDE BOTTOM OF THE POCKET TO THE TOP SURFACE OF THE CARRIER.
6. POCKET POSITION RELATIVE TO SPROCKET HOLE MEASURED AS TRUE POSITION OF POCKET，NOT POCKET HOLE.