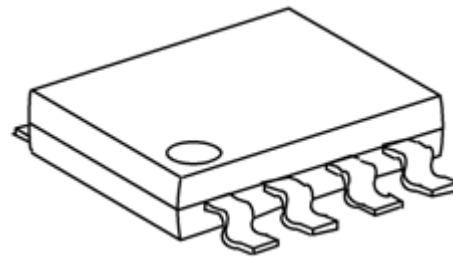


1.5 A, Step-Up/Down/Inverting Switching Regulators**GENERAL DESCRIPTION**

The FP34063 is a monolithic control circuit containing the primary functions required for DC-to-DC converters. These devices consist of an internal temperature compensated reference, comparator, controlled duty cycle oscillator with an active current limit circuit, driver and high current output switch. This series was specifically designed to be incorporated in Step-Down and Step-Up and Voltage Inverting applications with a minimum number of external components.

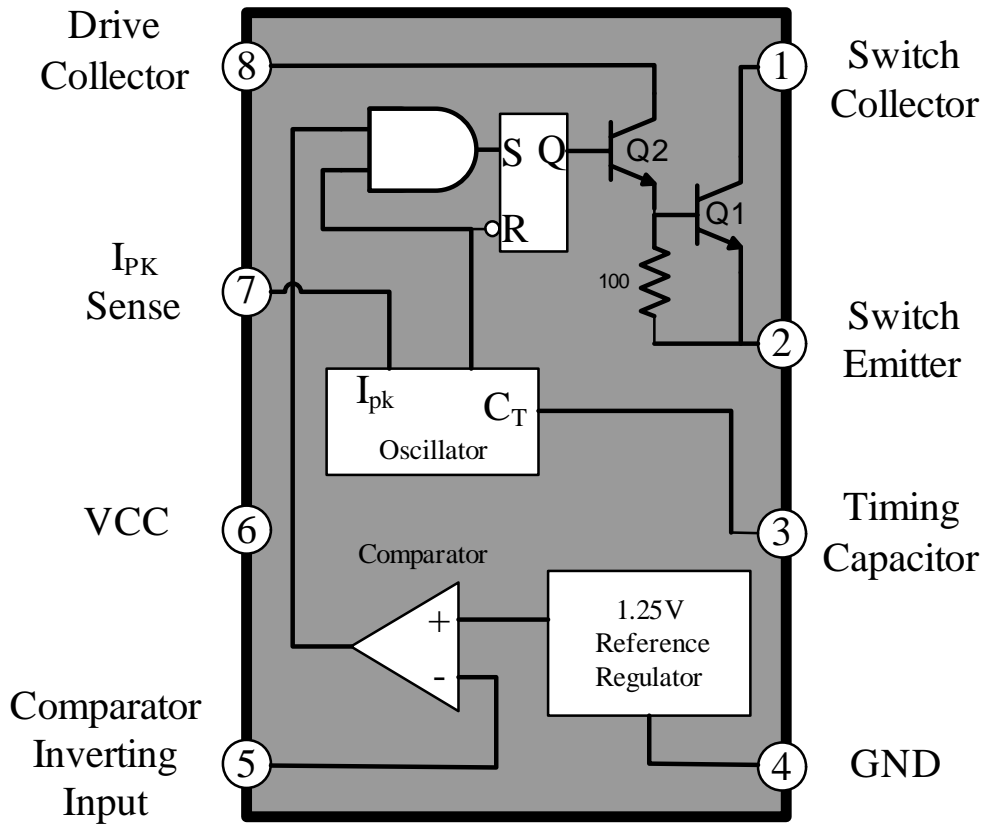
FEATURES

- I Operation from 3.0 V to 30 V Input
- I Low Standby Current
- I Current Limiting
- I Output Switch Current to 1.5 A
- I Output Voltage Adjustable
- I Frequency Operation to 100 kHz
- I Precision 2% Reference
- I SOP8 Package

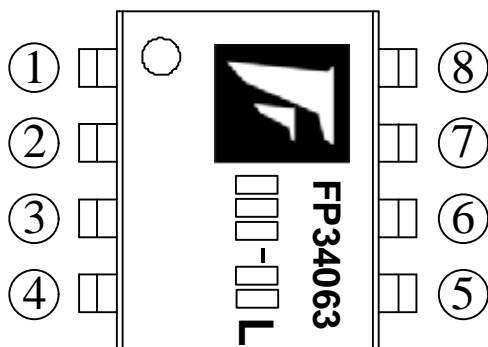
**SOP8****APPLICATION**

- I DC to DC Converter

FUNCTIONAL BLOCK DIAGRAM



MARK VIEW



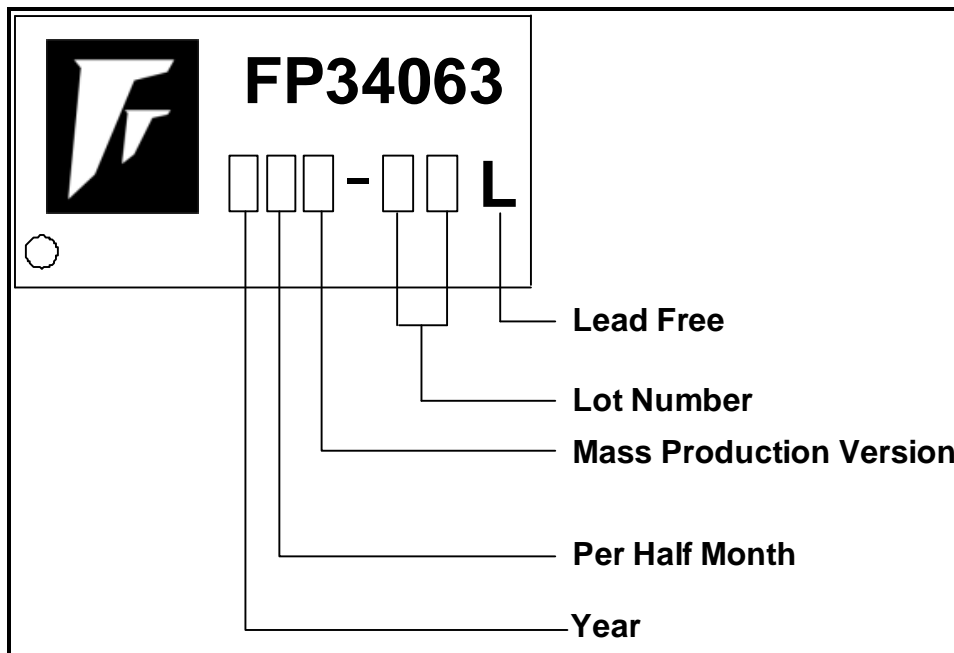
PIN DESCRIPTION

Name	No.	I/O	Description
SC	1	I	Switch Collector
SE	2	O	Switch Emitter
TC	3	I	Oscillator Timing Capacitor
GND	4	P	IC ground
IN-	5	I	Feedback Comparator Inverting Input
VCC	6	P	IC Power Supply
I _{PK}	7	I	Current Sense Input
DC	8	I	Driver Collector

ORDER INFORMATION

Part Number	Operating Temperature	Package	Description
FP34063DR-LF	-25°C ~ +85°C	SOP8	Tape & Reel
FP34063D-LF	-25°C ~ +85°C	SOP8	Tube
FP33063DR-LF	-40°C ~ +85°C	SOP8	Tape & Reel
FP33063D-LF	-40°C ~ +85°C	SOP8	Tube

IC DATE CODE DISTINGUISH



FOR EXAMPLE:

January A (Front Half Month), B (Last Half Month)
 February C, D
 March E, F -----And so on.

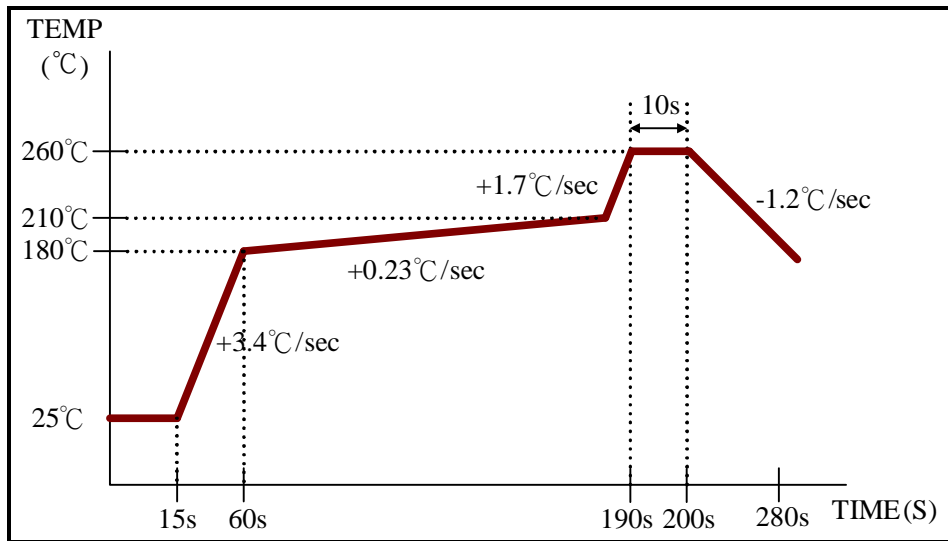
Lot Number is the last two numbers

For Example:

A3311C62
 └─▶ Lot Number

ABSOLUTE MAXIMUM RATINGS

Power Supply Voltage	30V
Comparator Inputs Voltage Range	-0.3V~VCC
Switch Collector Voltage	30V
Switch Emitter Voltage	30V
Switch Collector to Emitter Voltage	30V
Driver Collector Voltage	30V
Driver Collector Current	100mA
Switch Current	1.5A
Power Dissipation (SOP8, Ta=25°C)	600mW
Operation Junction Temperature	+150°C
Storage Temperature Range	-55°C~150°C
Operation Ambient Temperature Range(FP33063)	-40°C~+85°C
(FP34063)	-25°C~+85°C
SOP8 Lead Temperature (soldering, 10 sec)	+260°C



IR Re-flow Temperature vs. Second Curve

Note:

1. Maximum package power dissipation limits must be observed.

DC ELECTRICAL CHARACTERISTICS ($V_{CC}=5V$, $T_a = -25^{\circ}C \sim +85^{\circ}C$, unless otherwise noted)

OSCILLATOR

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Frequency	f_{osc}	$V_{PIN5}=0V, C_T=1.0nF, T_a=25^{\circ}C$	24	33	42	KHz
Charge Current	I_{chg}	$V_{CC}=5V\sim 30V, T_a=25^{\circ}C$	24	35	42	μA
Discharge Current	I_{dischg}	$V_{CC}=5V\sim 30V, T_a=25^{\circ}C$	140	220	260	μA
Discharge to Charge Current Ratio	I_{dischg}/I_{chg}	$T_a=25^{\circ}C$	5.2	6.5	7.5	-
Current Limit Sense Voltage	$V_{IPK(SENSE)}$	$I_{dischg}=I_{chg}, T_a=25^{\circ}C$	250	300	380	mV

OUTPUT SWITCH

Saturation Voltage (Darlington Connection)	$V_{CE(sat)}$	$I_{SW}=1A, Pins 1,8 connected$	-	1.0	1.3	V
Saturation Voltage	$V_{CE(sat)}$	$I_{SW}=1A, R_{PIN8}=82\Omega to V_{CC}, Forced \beta=20$	-	0.45	0.7	V
DC Current Gain	h_{FE}	$I_{SW}=1A, V_{CE}=5V, T_a=25^{\circ}C$	50	75	-	-
Collector Off-State Current	$I_{C(off)}$	$V_{CE}=30V$		0.1	100	μA

COMPARATOR

Threshold Voltage	V_{th}	$T_a=25^{\circ}C$	1.225	1.25	1.275	V
		$T_a = -25^{\circ}C \sim +85^{\circ}C$	1.21	-	1.29	-
Threshold Voltage Line Regulation	Reg_{line}	$V_{CC}=3V\sim 30V$	-	2	-	mV
Input Bias Current	I_{IB}	$V_{IN}=0V$	-	-20	-400	nA

TOTAL DEVICE

Supply Current	I_{CC}	$V_{CC}=5V\sim 30V, C_T=1.0nF, Pin7=V_{CC}, V_{PIN5}>V_{th}, Pin2=GND, others open$	-	2	4	mA
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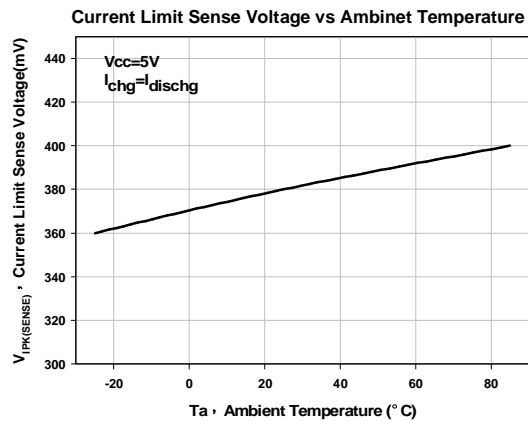
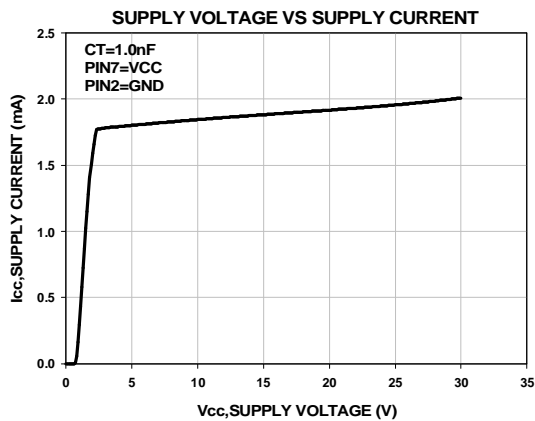
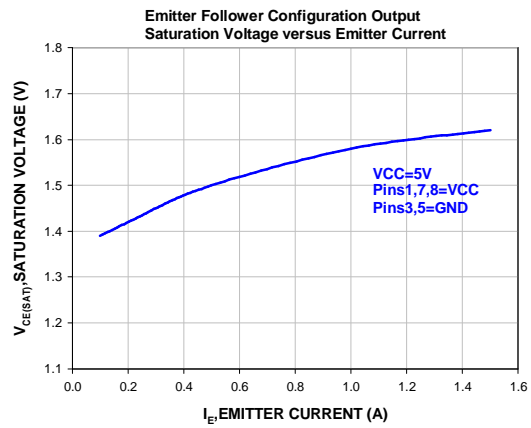
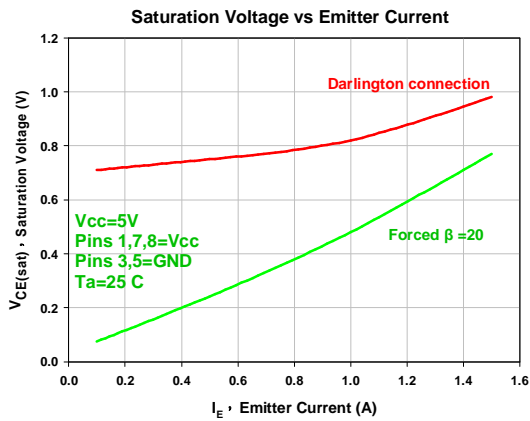
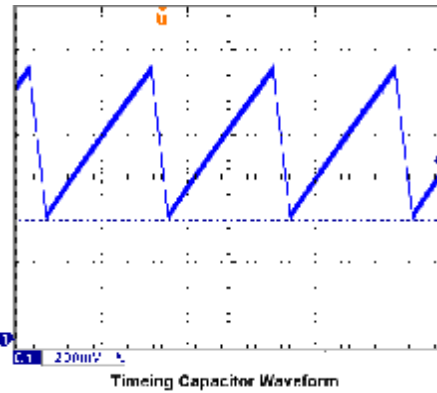
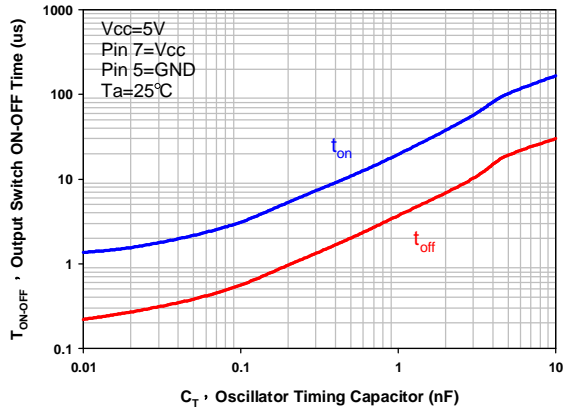
- Low duty cycle pulse techniques are used during test to maintain junction temperature as close to ambient temperature as possible.
- If the output switch is driven into hard saturation (non-Darlington configuration) at low switch currents (≤ 300 mA) and high driver currents (≥ 30 mA), it may take up to 2.0 μs for it to come out of saturation. This condition will shorten the off time at frequencies ≥ 30 kHz, and is magnified at high temperatures. This condition does not occur with a Darlington configuration, since the output switch cannot saturate. If a non-Darlington configuration is used, the following output drive condition is recommended:

$$\text{Forced of output switch : } \frac{I_{C_{output}}}{I_{C_{driver}} - 7.0mA^*} \geq 10$$

* The 100 Ω resistor in the emitter of the driver device requires about 7.0 mA before the output switch conducts.

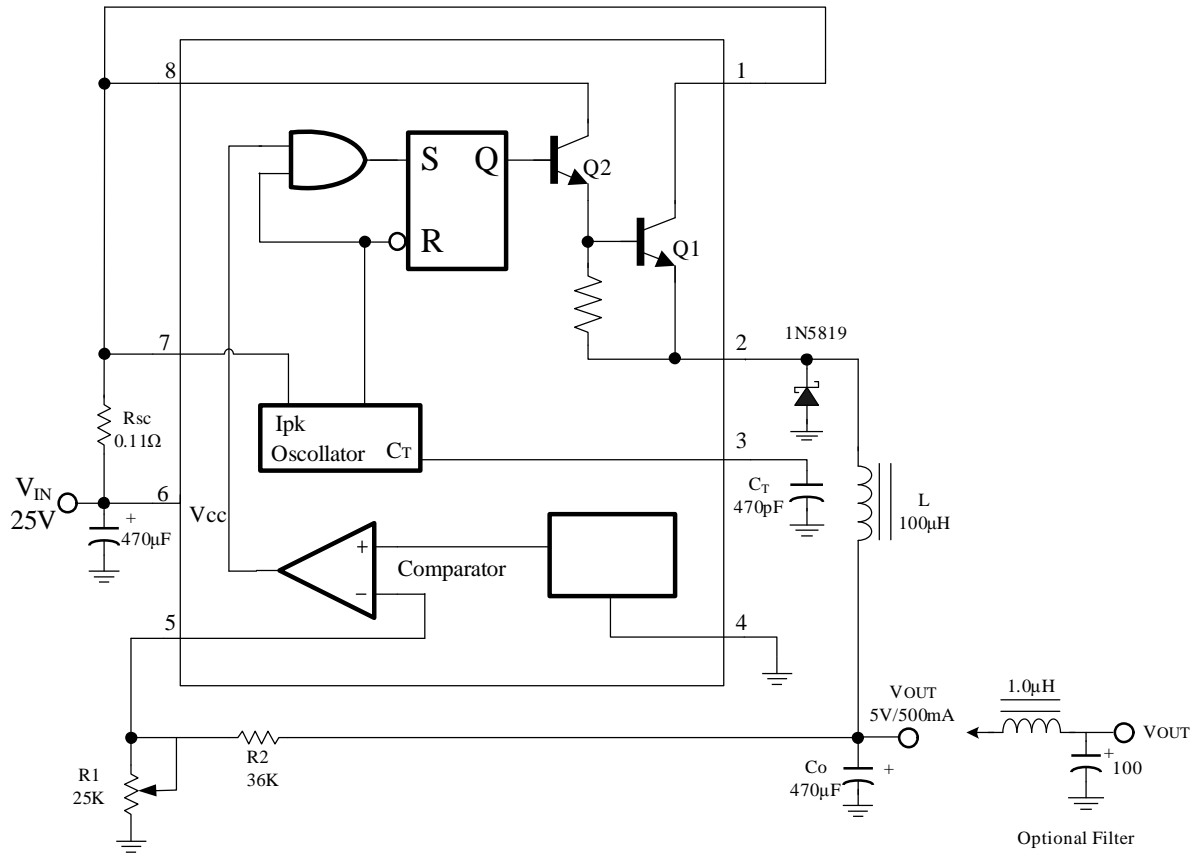
TYPICAL CHARACTERISTICS (Ta=+25°C, VCC=5V)

Output Switch ON-OFF Time vs Oscillator Timing Capacitor



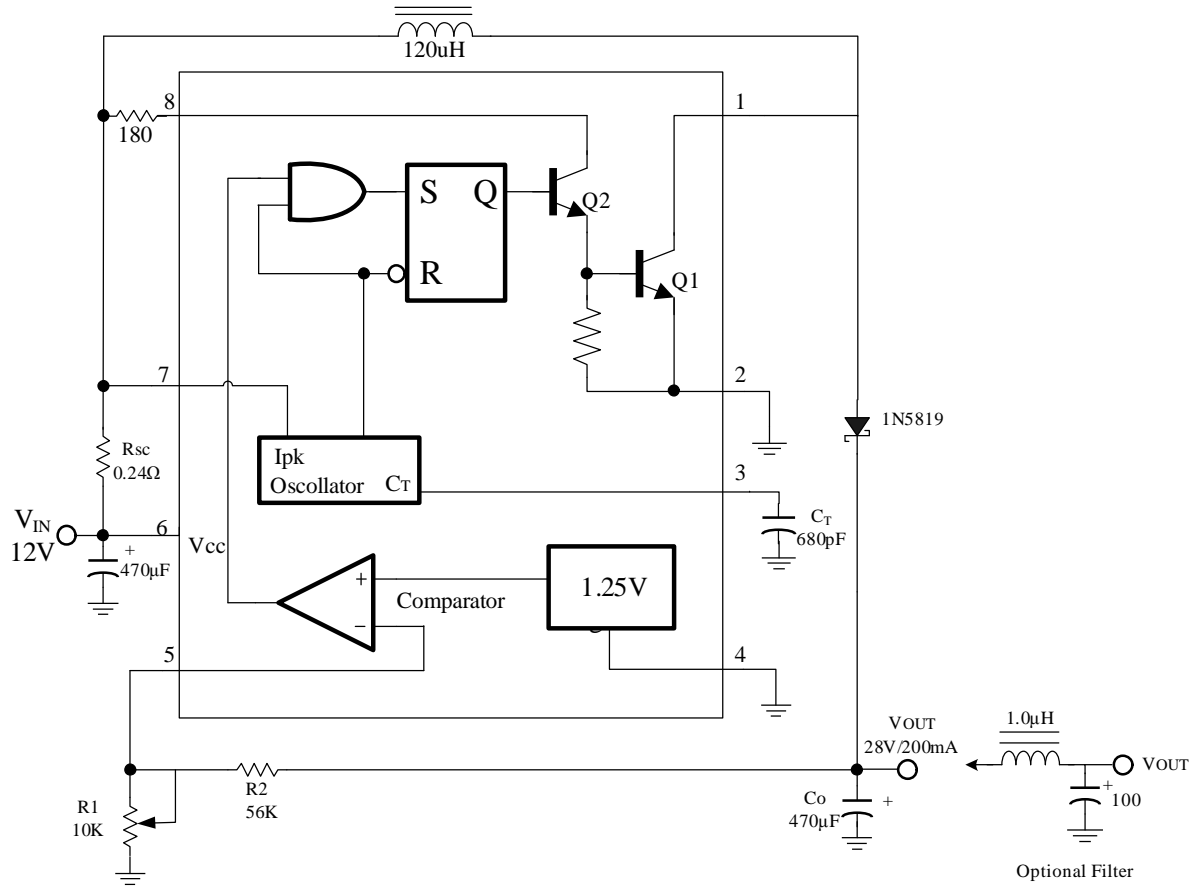
APPLICATION NOTE

Step-Down Converter



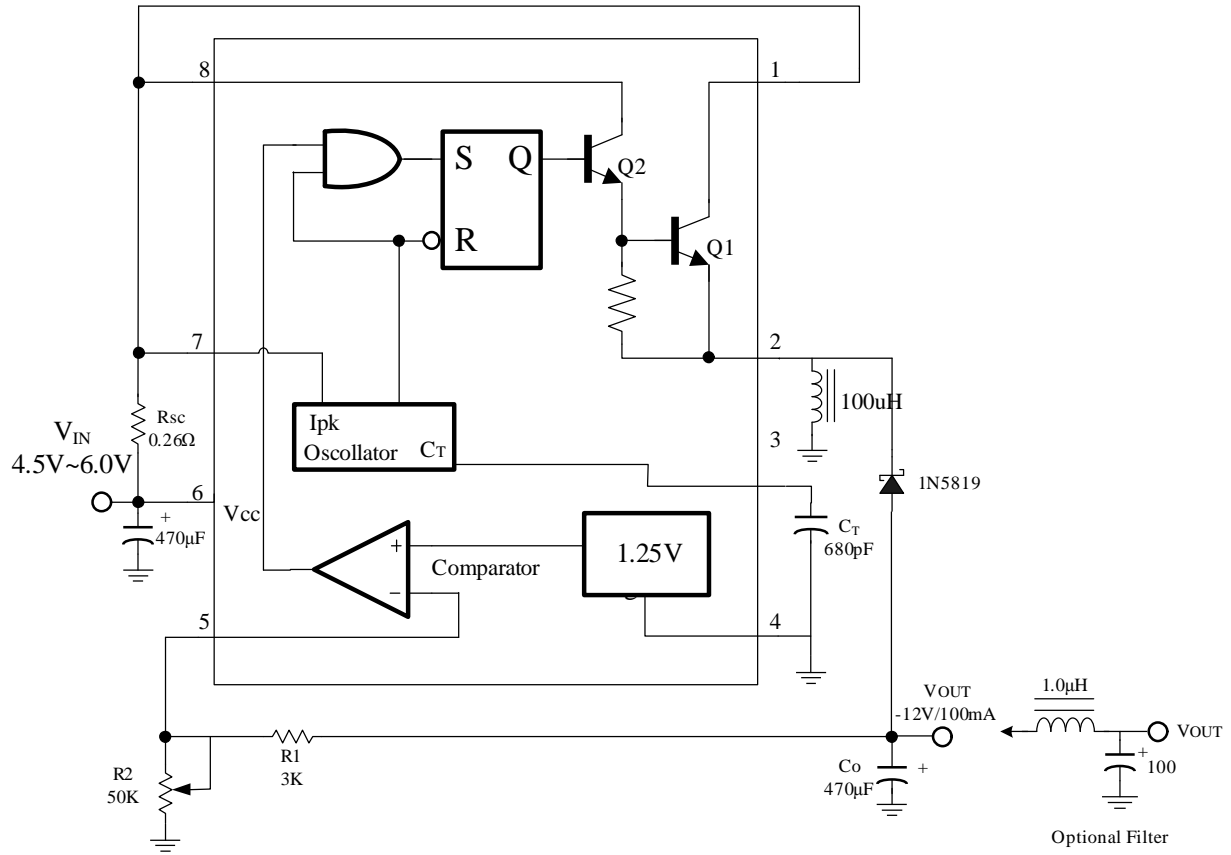
Test	Conditions	Results
Line Regulation	$V_{IN}=12V$ to $24V, I_O=500mA$	$12mV=\pm 0.2\%$
Load Regulation	$V_{IN}=24V, I_O=50mA$ to $500mA$	$3.0mV=\pm 0.05\%$
Output Ripple	$V_{IN}=24V, I_O=500mA$	$160mV_{pp}$
Efficiency	$V_{IN}=24V, I_O=500mA$	82%

Step-Up Converter



Test	Conditions	Results
Line Regulation	$V_{IN}=9.0V$ to $12V, I_O=200mA$	$20mV=\pm 0.035\%$
Load Regulation	$V_{IN}=12V, I_O=50mA$ to $200mA$	$15mV=\pm 0.035\%$
Output Ripple	$V_{IN}=12V, I_O=200mA$	$500mV_{pp}$
Efficiency	$V_{IN}=12V, I_O=200mA$	80%

Voltage Inverting Converter



Test	Conditions	Results
Line Regulation	$V_{IN}=4.5V$ to $6.0V, I_O=100mA$	$20mV=\pm 0.08\%$
Load Regulation	$V_{IN}=5.0V, I_O=20mA$ to $100mA$	$30mV=\pm 0.12\%$
Output Ripple	$V_{IN}=5.0V, I_O=100mA$	$500mV_{pp}$
Efficiency	$V_{IN}=5.0V, I_O=100mA$	60%

Design Formula Table

Calculation	Step-Up	Step-Down	Voltage-Inverting
t_{on}/t_{off}	$\frac{V_{OUT} + V_F - V_{IN(MIN)}}{V_{IN(MIN)} - V_{SAT}}$	$\frac{V_{OUT} + V_F}{V_{IN(MIN)} - V_{SAT} - V_{OUT}}$	$\frac{ V_{OUT} + V_F}{V_{IN} - V_{SAT}}$
$(t_{on}+t_{off})$	$\frac{1}{f}$	$\frac{1}{f}$	$\frac{1}{f}$
t_{off}	$\frac{t_{on} + t_{off}}{\frac{t_{on}}{t_{off}} + 1}$	$\frac{t_{on} + t_{off}}{\frac{t_{on}}{t_{off}} + 1}$	$\frac{t_{on} + t_{off}}{\frac{t_{on}}{t_{off}} + 1}$
t_{on}	$(t_{on} + t_{off}) - t_{off}$	$(t_{on} + t_{off}) - t_{off}$	$(t_{on} + t_{off}) - t_{off}$
C_T	$4.0 * 10^{-5} t_{on}$	$4.0 * 10^{-5} t_{on}$	$4.0 * 10^{-5} t_{on}$
$I_{PK(SWITCH)}$	$2I_{out(max)} (\frac{t_{on}}{t_{off}} + 1)$	$2I_{out(max)}$	$2I_{out(max)} (\frac{t_{on}}{t_{off}} + 1)$
R_{SC}	$0.3 / I_{PK(SWITCH)}$	$0.3 / I_{PK(SWITCH)}$	$0.3 / I_{PK(SWITCH)}$
$L_{(MIN)}$	$\left(\frac{V_{in(min)} - V_{sat}}{I_{pk(switch)}} \right) t_{on(max)}$	$\left(\frac{V_{in(min)} - V_{sat} - V_{out}}{I_{pk(switch)}} \right) t_{on(max)}$	$\left(\frac{V_{in(min)} - V_{sat}}{I_{pk(switch)}} \right) t_{on(max)}$
C_O	$9 \frac{I_{out} t_{on}}{V_{ripple(pp)}}$	$\frac{I_{PK(SWITCH)} (t_{ON} + t_{OFF})}{8V_{ripple(pp)}}$	$9 \frac{I_{OUT} t_{ON}}{V_{ripple(pp)}}$

V_{sat} =Saturation voltage of the output switch.

V_F =Forward voltage drop of the output rectifier.

V_{in} → Nominal input voltage.

V_{out} → Desired output voltage, $|V_{out}| = 1.25(1 + \frac{R2}{R1})$

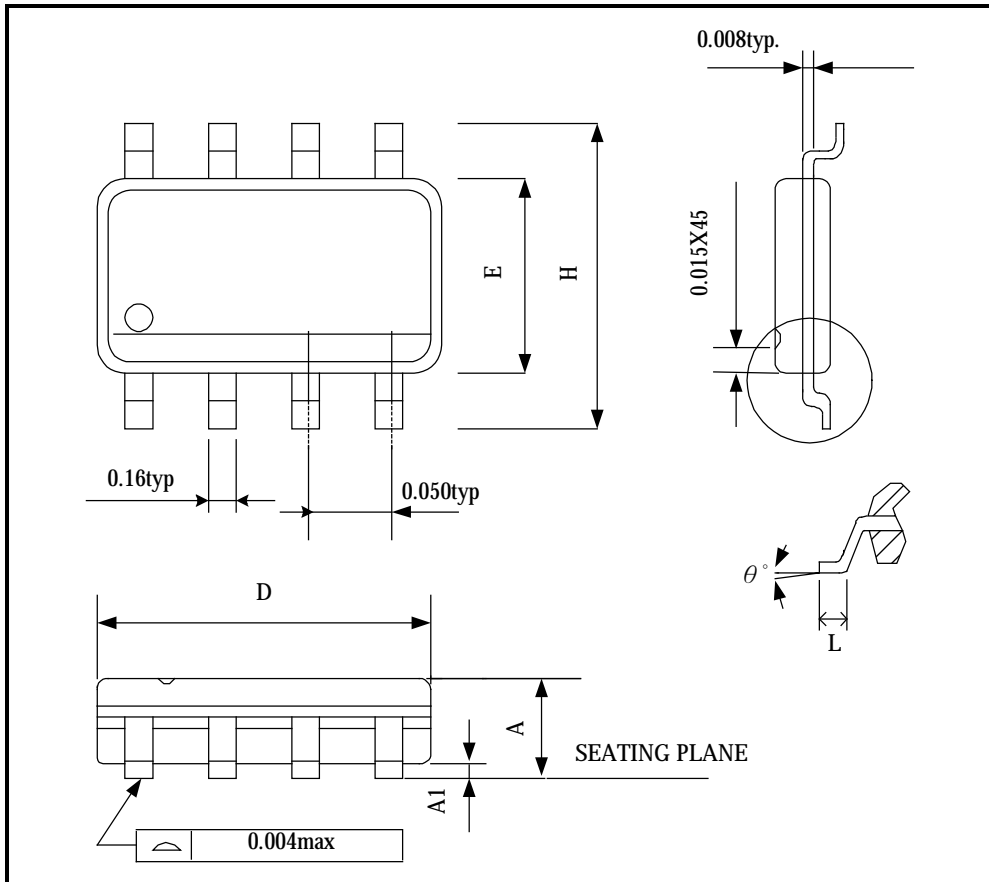
I_{out} → Desired output current.

f_{min} → Minimum desired output switching frequency at the selected values of V_{in} and I_o .

$V_{ripple(pp)}$ → Desired peak to peak output ripple voltage. In practice, the calculated capacitor value will need to be increased due to its equivalent series resistance and board layout. The ripple voltage should be kept to a low value since it will directly affect the line and load regulation.

PACKAGE OUTLINE

SOP8



SYMBOLS	MIN	MAX
A	0.053	0.069
A1	0.004	0.010
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

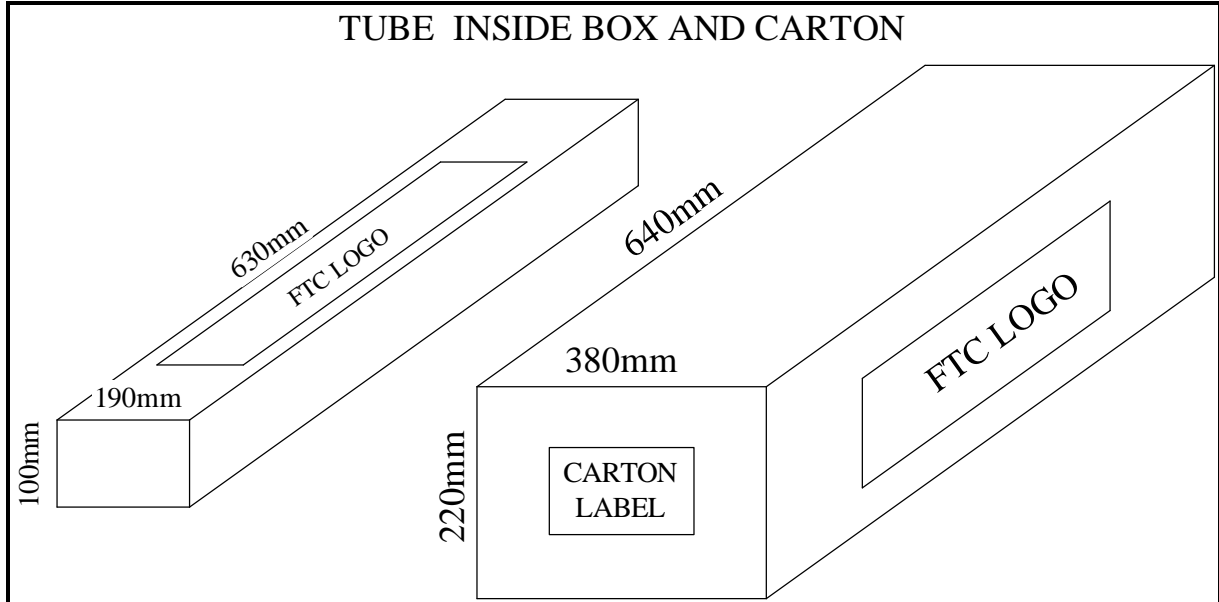
NOTE:

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 (.06in) PER SIDE ◦
3. DIMENSIONS “E” DOES NOT INCLUDE INTER-LEAD FLASH,OR PROTRUSIONS INTER-LEAD FLASH AND PROTRUSIONS SHALL NOT EXCEED .25mm (.0.10in) PER SIDE ◦

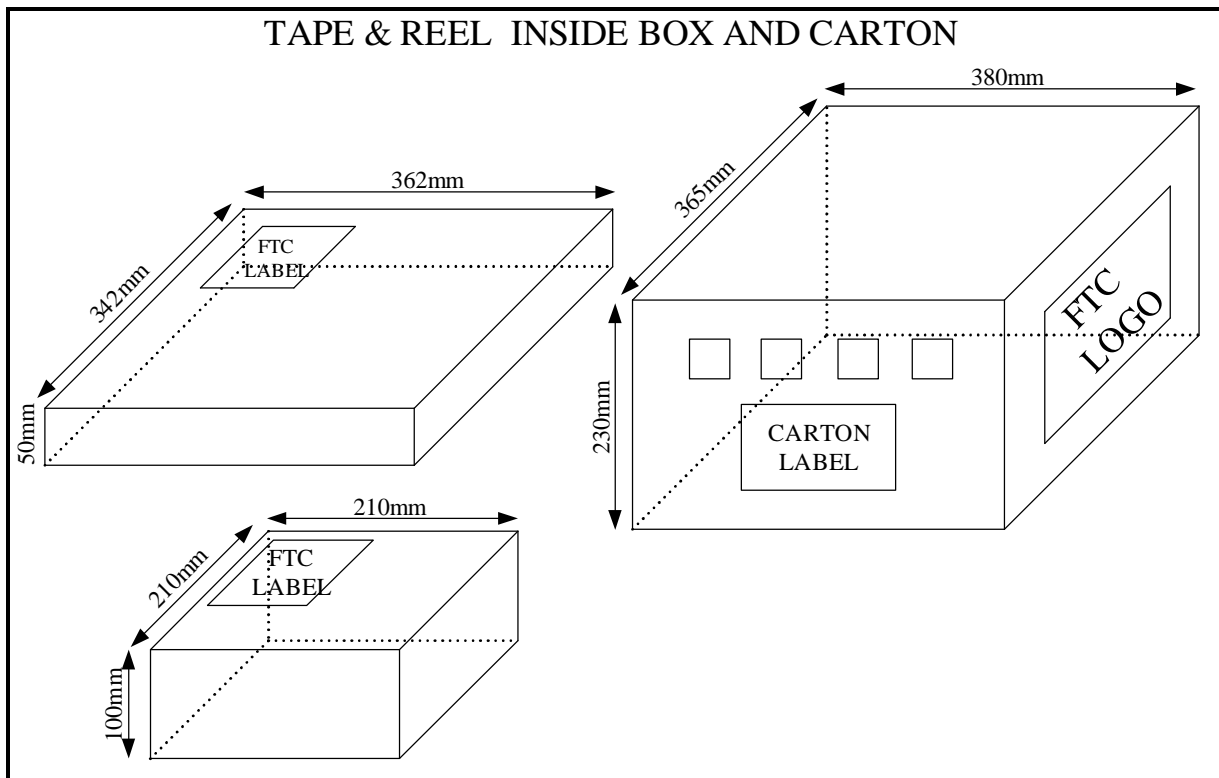
PACKING SPECIFICATIONS

BOX & CARTON DIMENSION

SOP8



SOP8



PACKING QUANTITY SPECIFICATIONS

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

LABEL SPECIFICATIONS

TAPPING & REEL

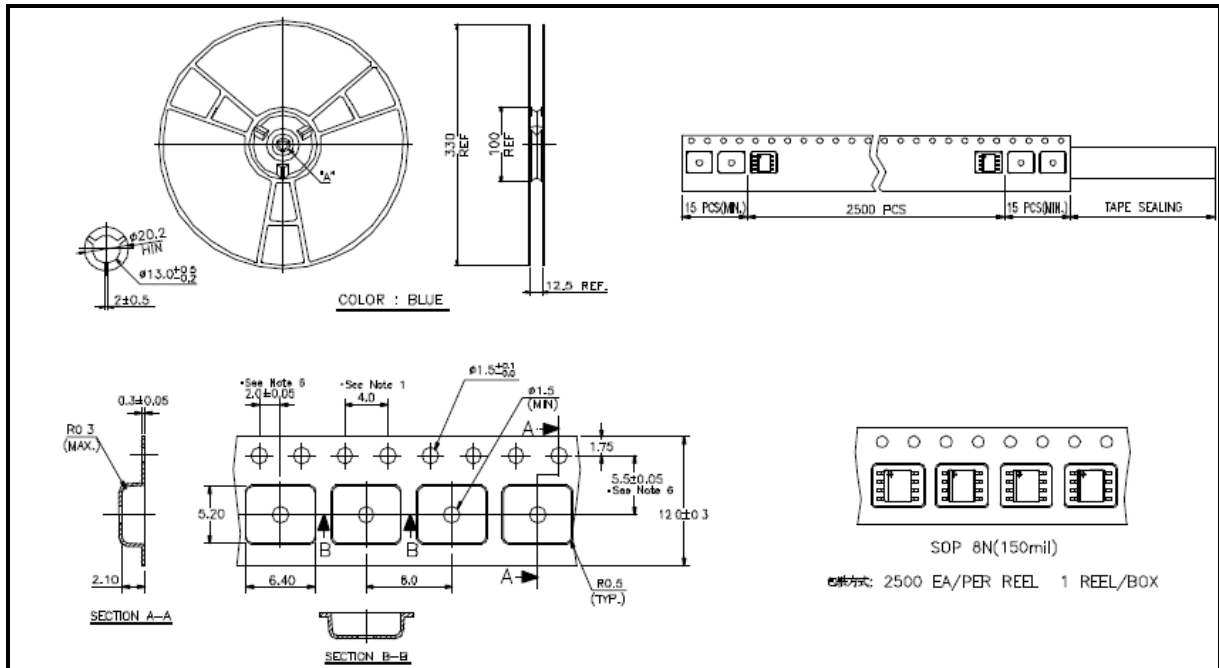
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Lot NO: A3311CXX-L	
D/C: 6Xx-XXL	
Q`ty: 2500	
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無鉛 Lead Free	

CARTON

Feeling Technology Corp	
Product Type: FP34063DR-LF	
Lot No: A3311CXX-L	
Date Code: 4Xx-XXL	
Package Type:SOP8	
Marking Type:Laser	
Total Q`ty: 10,000	
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無鉛 Lead Free	

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. A₀ AND B₀ MEASURED ON A PLANE 0.3mm ABOVE THE BOTTOM OF THE POCKET ◦
5. K₀ 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 ◦