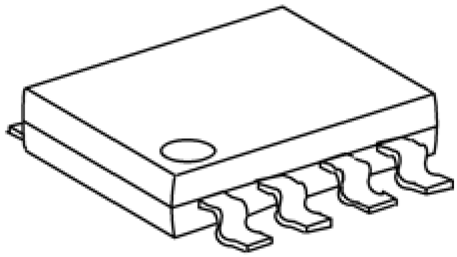
1.5 A, Step-Up/Down/Inverting Switching Regulators

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

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

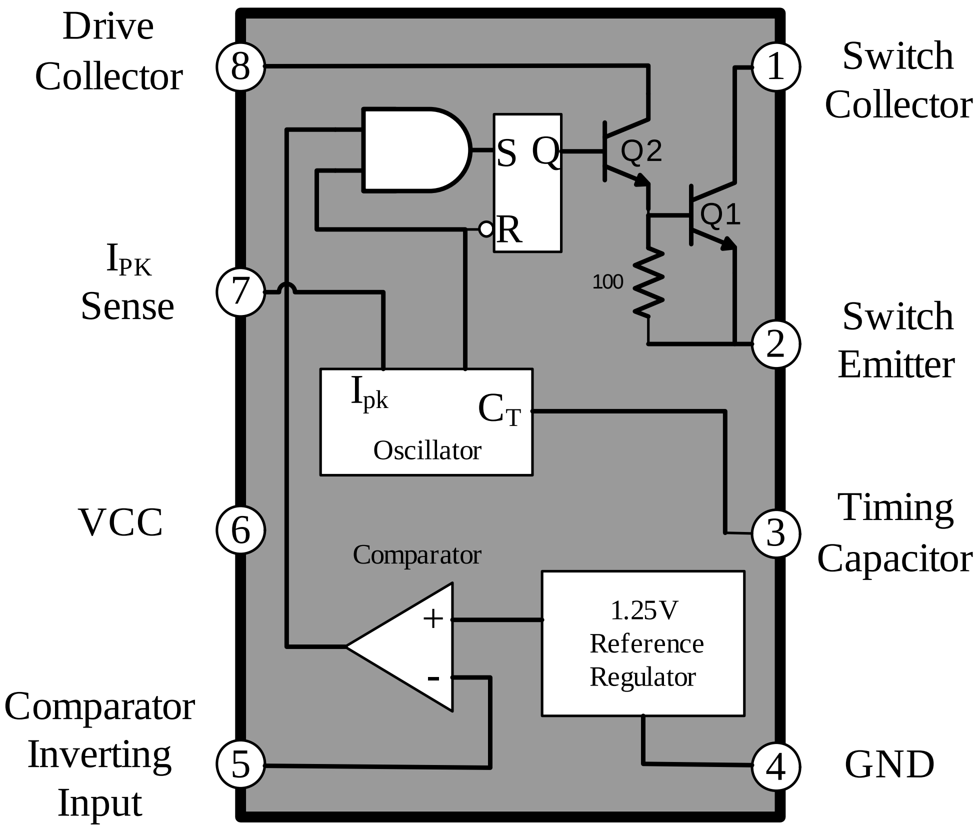


SOP8

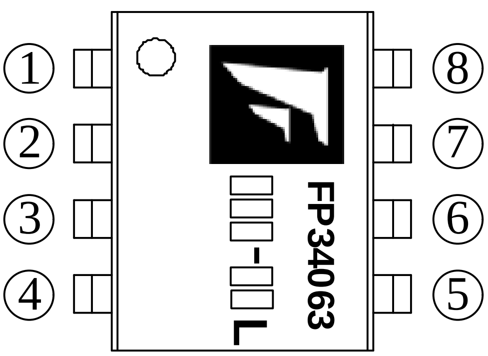
APPLICATION

- DC to DC Converter

FUNCTIONAL BLOCK DIAGRAM



MARK VIEW



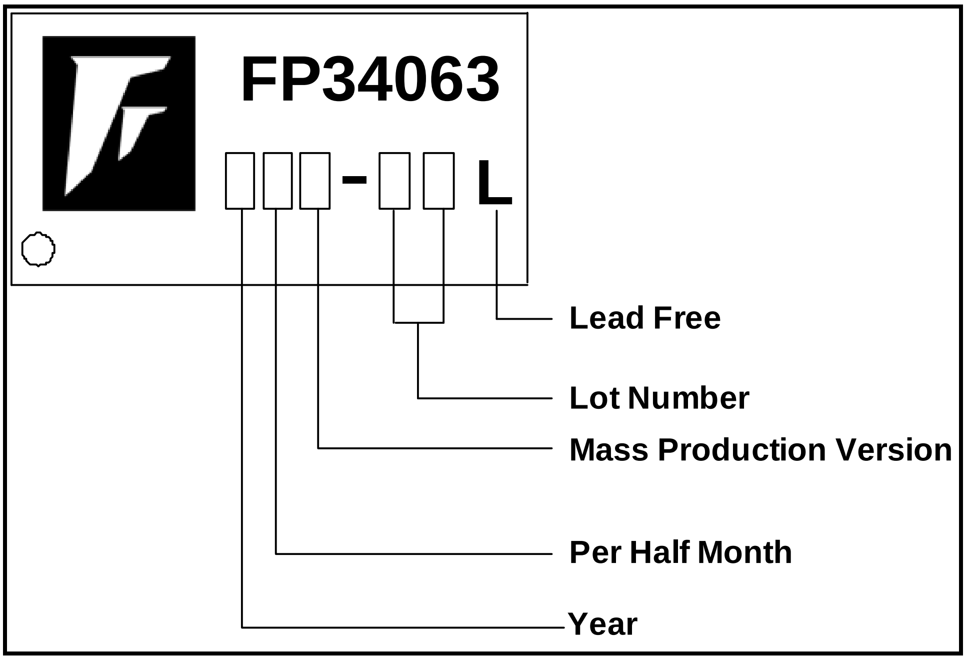
PIN DESCRIPTION

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

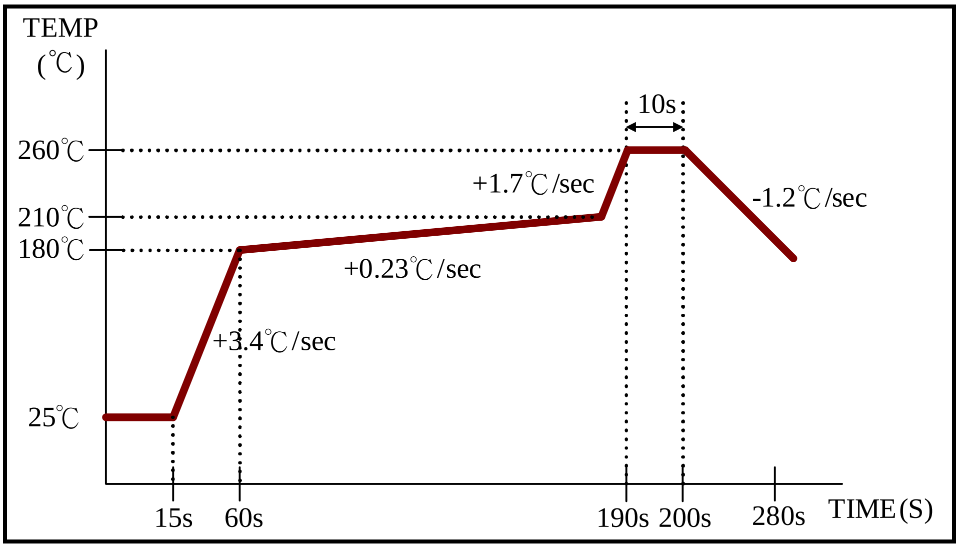
For Example:

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℃)	600mW
Operation Junction Temperature	+150℃
Storage Temperature Range	–55℃~150℃
Operation Ambient Temperature Range(FP33063)	–40℃~+85℃
(FP34063)	–25℃~+85℃
SOP8 Lead Temperature (soldering, 10 sec)	+260℃



IR Re-flow Temperature vs. Second Curve

Note:

1. Maximum package power dissipation limits must be observed.

DC ELECTRICAL CHARACTERISTICS(Vcc=5V，T_a= -25℃~+85℃, 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℃	24	33	42	KHz
Charge Current	I_{chg}	Vcc=5V~30V, T_a=25℃	24	35	42	uA
Discharge Current	I_{dischg}	Vcc=5V~30V, T_a=25℃	140	220	260	uA
Discharge to Charge Current Ratio	I_{dischg}/I_{chg}	T_a=25℃	5.2	6.5	7.5	-
Current Limit Sense Voltage	$V_{IPK(SENSE)}$	I_{dischg}=I_{chg},T_a=25℃	250	300	380	mV

OUTPUT SWITCH

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
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}=82Ω to Vcc,Forced β≈20	-	0.45	0.7	V
DC Current Gain	h_{FE}	I_{SW}=1A,V_{CE}=5V,T_a=25℃	50	75	-	-
Collector Off-State Current	$I_{C(off)}$	V_{CE}=30V		0.1	100	uA

COMPARATOR

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Threshold Voltage	Vth	T_a=25℃	1.225	1.25	1.275	V
		T_a= -25℃~+85℃	1.21	-	1.29	-
Threshold Voltage Line Regulation	Reg_{line}	Vcc=3V~30V	-	2	-	mV
Input Bias Current	I_{IB}	V_{IN-}=0V	-	-20	-400	nA

TOTAL DEVICE

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply Current	I_{CC}	V_{CC}=5V~30V,C_T=1.0nF, Pin7=Vcc,V_{PIN5}>Vth, Pin2=GND,others open	-	2	4	mA

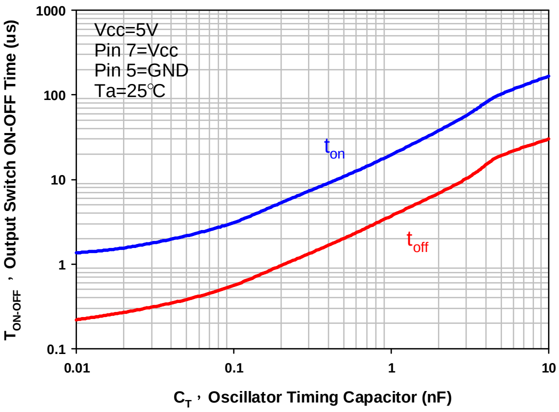
2. Low duty cycle pulse techniques are used during test to maintain junction temperature as close to ambient temperature as possible.
3. If the output switch is driven into hard saturation (non-Darlington configuration) at low switch currents (≦300 mA) and high driver currents(≧30 mA), it may take up 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 anon-Darlington configuration is used, the following output drive condition is recommended:

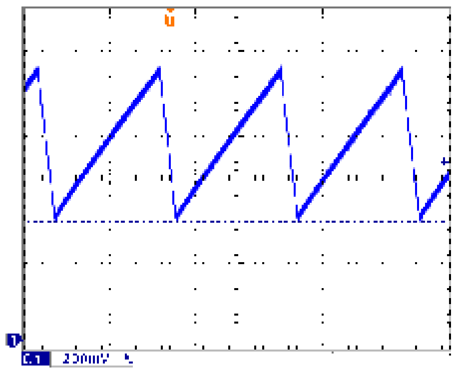
$$\text{Forced of output switch : } \frac{Ic_{output}}{Ic_{driver} - 7.0mA^{*}} \geq 10$$

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

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

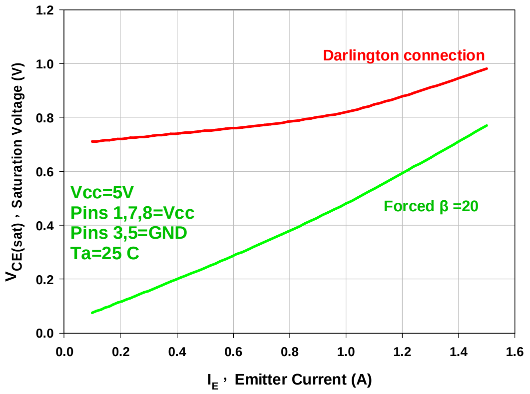
Output Switch ON-OFF Time vs Oscillator Timing Capacitor



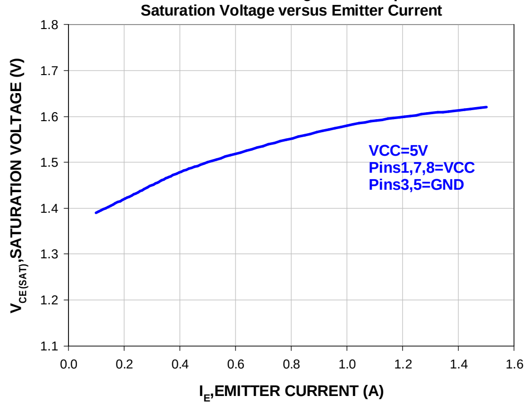


Timeing Capacitor Waveform

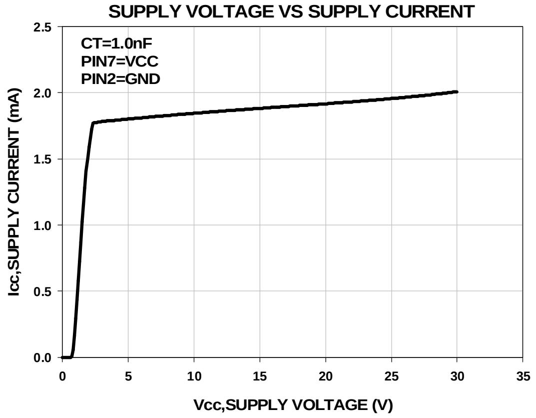
Saturation Voltage vs Emitter Current



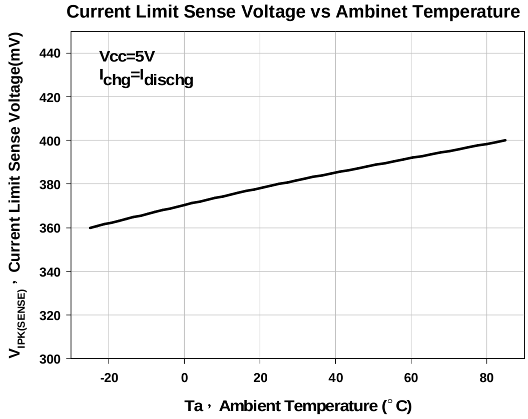
Emitter Follower Configuration Output
Saturation Voltage versus Emitter Current



SUPPLY VOLTAGE VS SUPPLY CURRENT

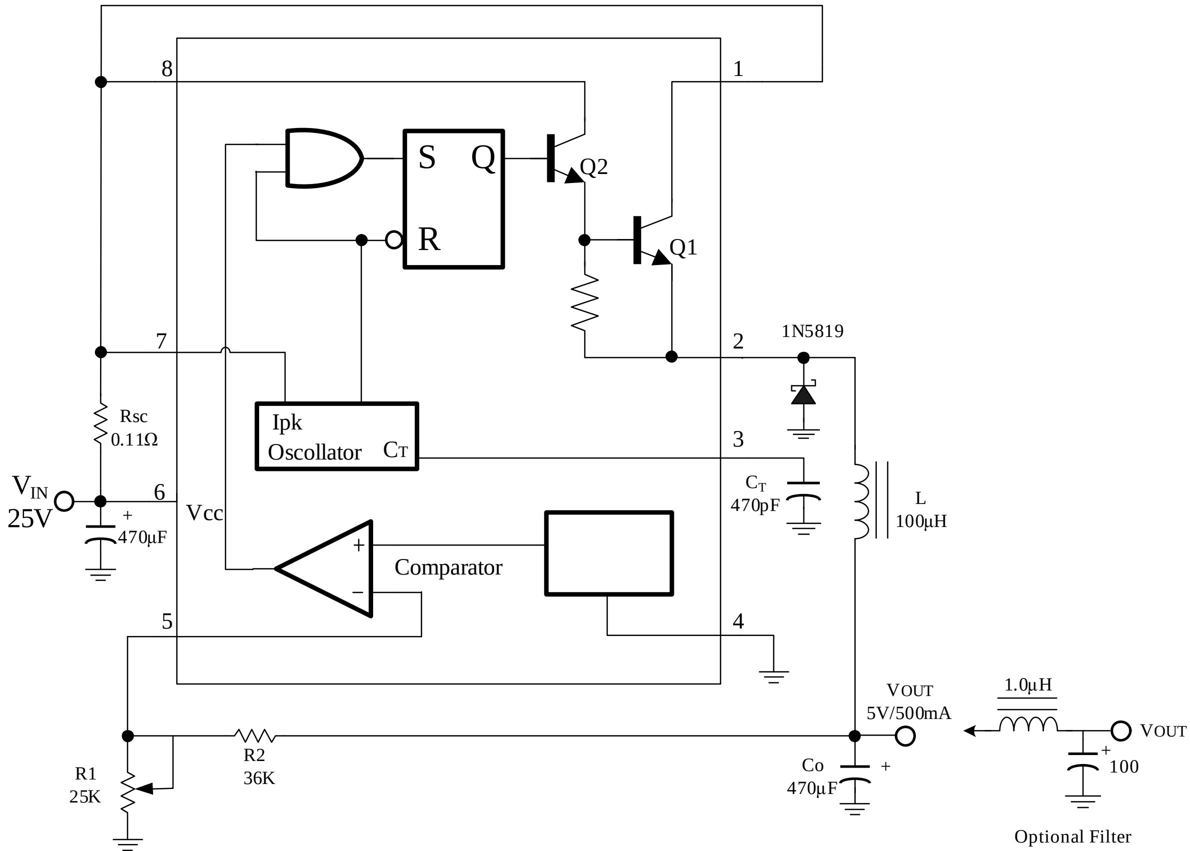


Current Limit Sense Voltage vs Ambinet Temperature



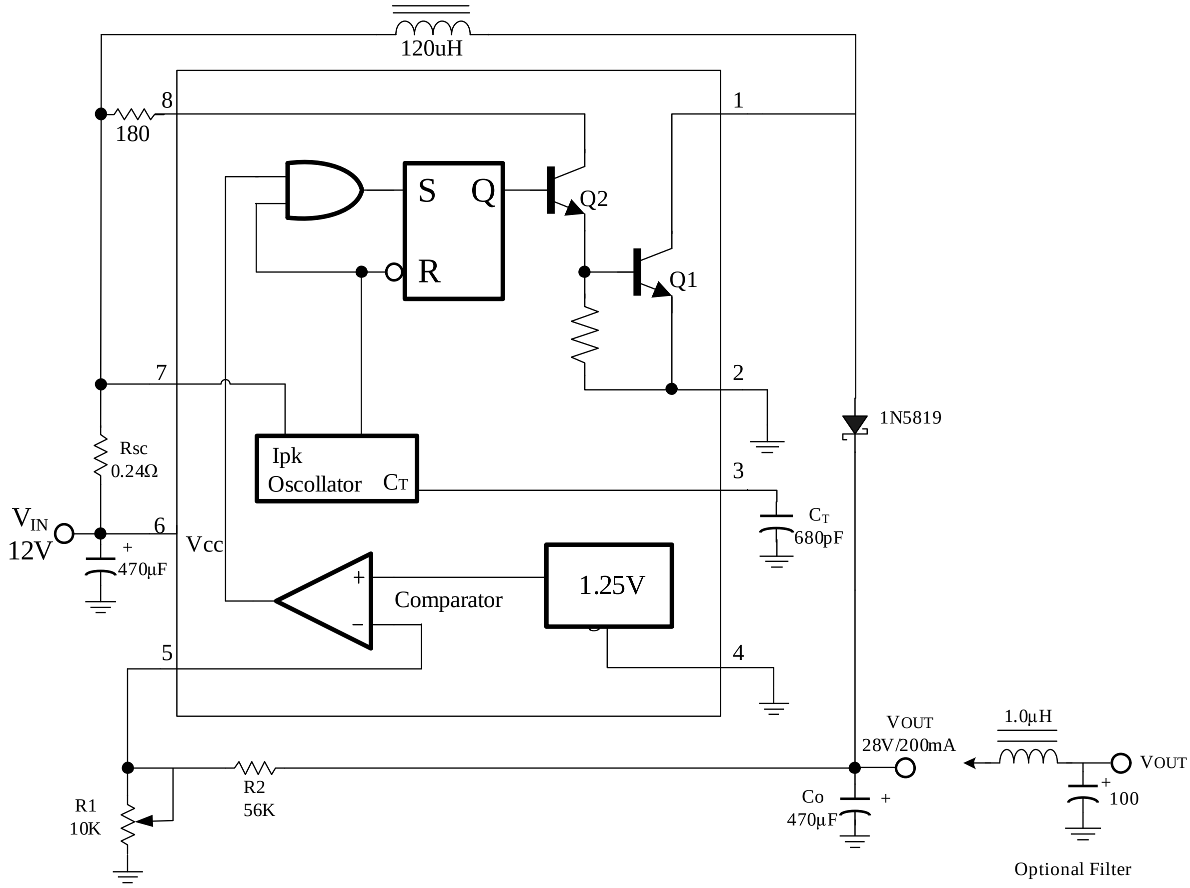
APPLICATION NOTE

Step-Down Converter



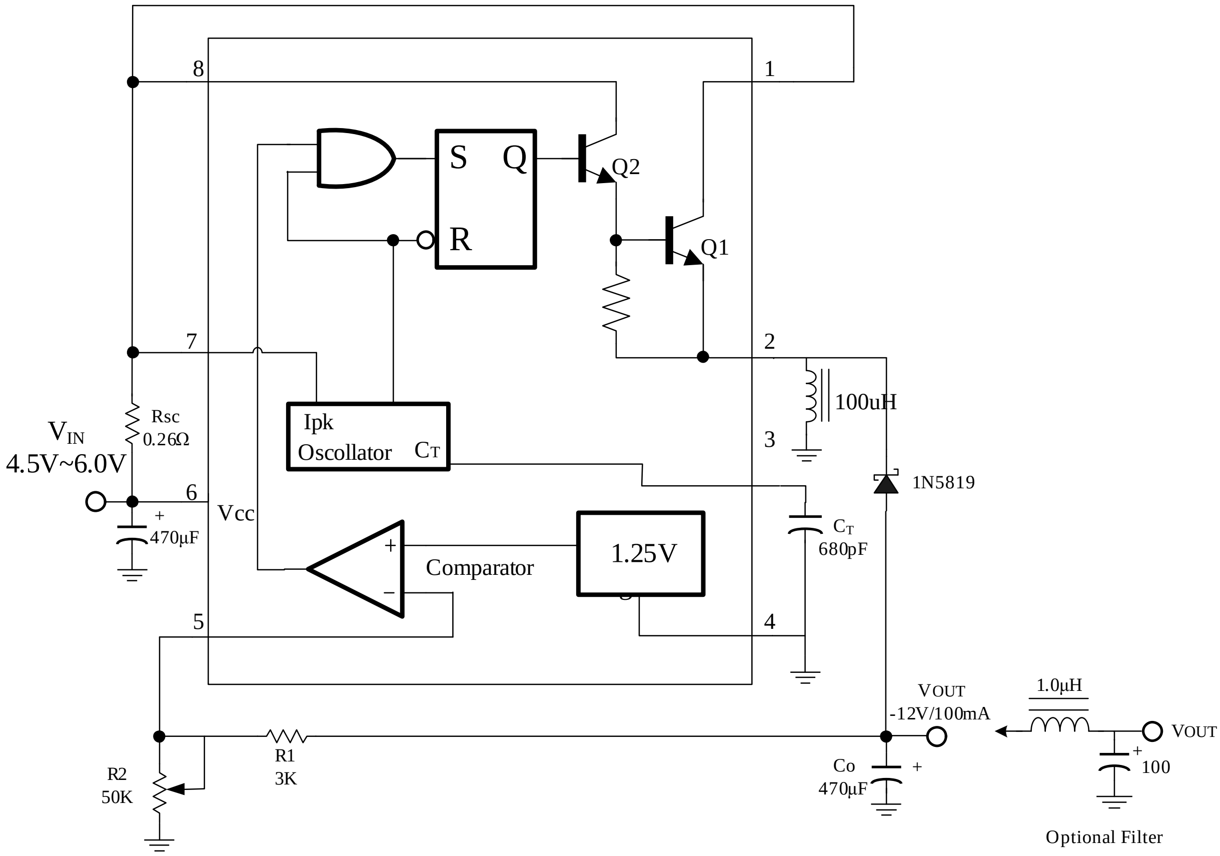
Test	Conditions	Results
Line Regulation	V_{IN}=12V to 24V,I_O=500mA	12mV=±0.2%
Load Regulation	V_{IN}=24V,I_O=50mA to 500mA	3.0mV=±0.05%
Output Ripple	V_{IN}=24,I_O=500mA	160mVpp
Efficiency	V_{IN}=24,I_O=500mA	82%

Step-Up Converter



Test	Conditions	Results
Line Regulation	V_{IN}=9.0V to 12V,I_O=200mA	20mV=±0.035%
Load Regulation	V_{IN}=12V,I_O=50mA to 200mA	15mV=±0.035%
Output Ripple	V_{IN}=12V,I_O=200mA	500mVpp
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=±0.08%
Load Regulation	V_{IN}=5.0V,I_O=20mA to 100mA	30mV=±0.12%
Output Ripple	V_{IN}=5.0V,I_O=100mA	500mVpp
Efficiency	V_{IN}=5.0V,I_O=100mA	60%

Design Formula Table

Calculation	Step-Up	Step-Down	Voltage-Inverting
t_{on}/t_{off}	$\frac{V_{OUT}+V_F-V_{IN(MIN)}}{V_{IN(MIN)}-V_{SAT}}$	$\frac{V_{OUT}+V_F}{V_{IN(MIN)}-V_{SAT}-V_{OUT}}$	$\frac{\lvert V_{OUT}\rvert+V_F}{V_{IN}-V_{SAT}}$
$(t_{on}+t_{off})$	$\frac{1}{f}$	$\frac{1}{f}$	$\frac{1}{f}$
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}	$\left(t_{on}+t_{off}\right)-t_{off}$	$\left(t_{on}+t_{off}\right)-t_{off}$	$\left(t_{on}+t_{off}\right)-t_{off}$
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} **à** Nominal input voltage.

V_{out} **à** Desired output voltage, $\lvert Vout\rvert=1.25(1+\frac{R2}{R1})$

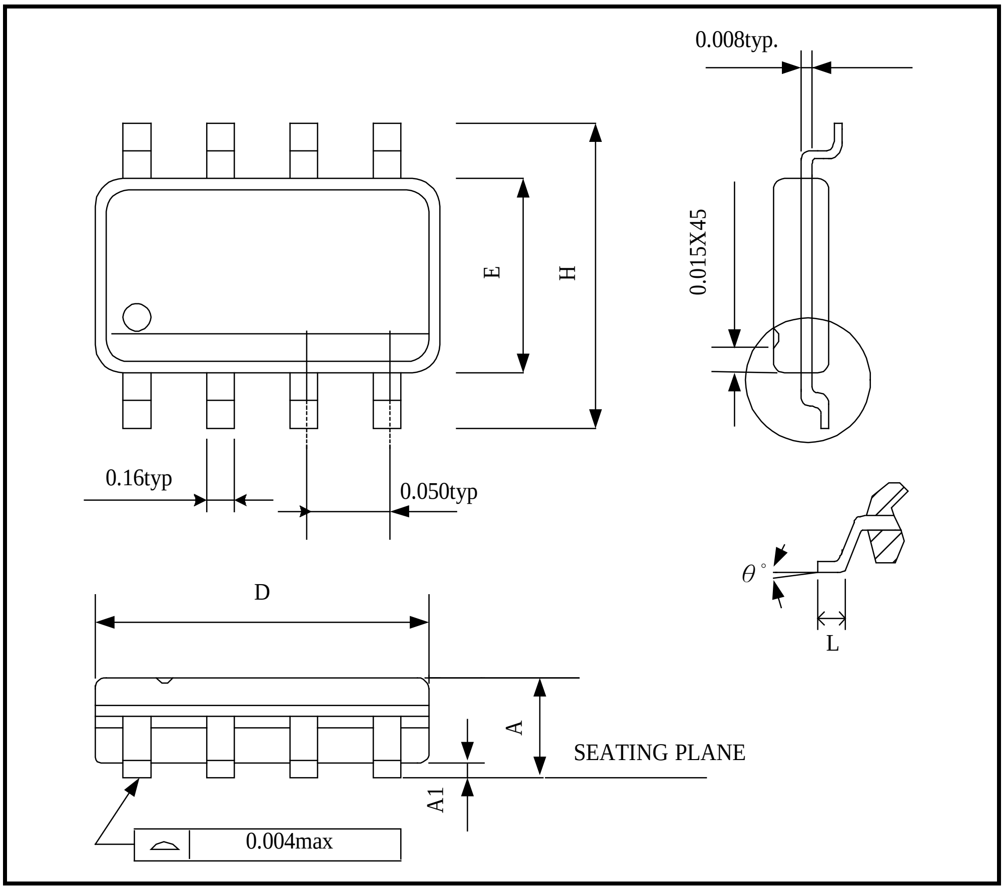
I_{out} **à** Desired output voltage.

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

$V_{ripple(pp)}$ **à** 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 requlation.

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

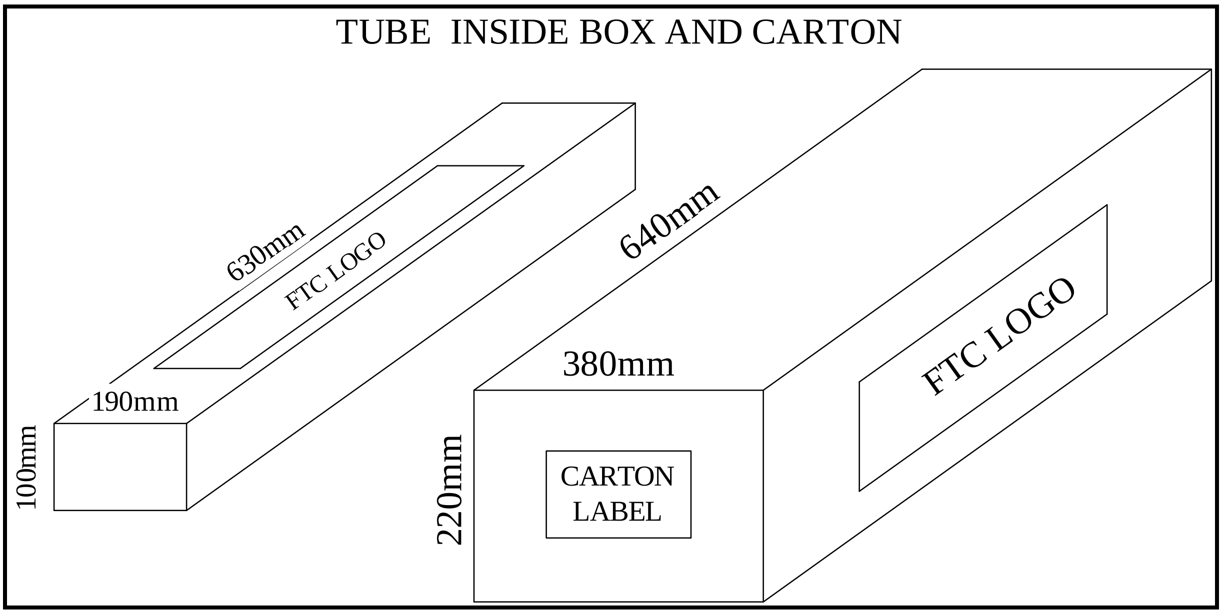
NOTE:

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 (.0.06in) 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



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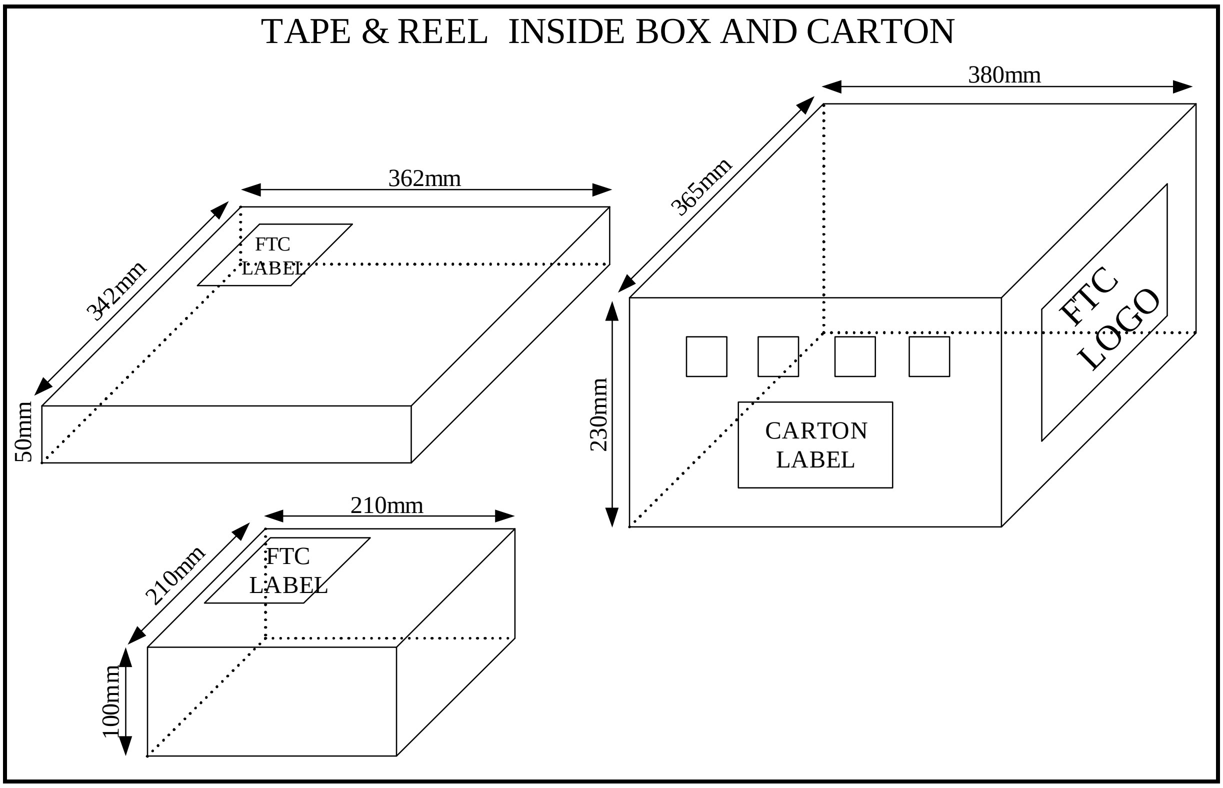


PACKING QUANTITY SPECIFICATIONS

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

LABEL SPECIFICATIONS

TAPPING & REEL

Feeling Technology Corp
Product:FP34063 DR-LF
Lot NO: A3311CXX-L
D/C: 6Xx-XXL
Q`ty: 2500

無鉛
Lead Free

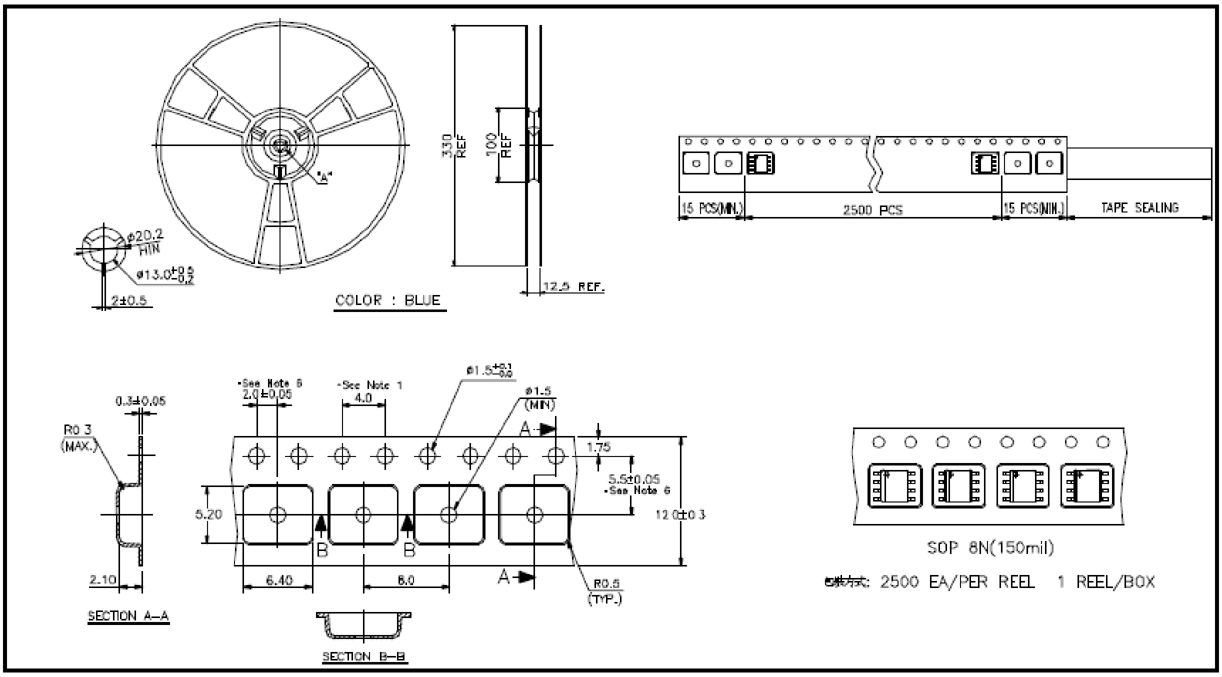
CARTON

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

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. 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。