FP5132A

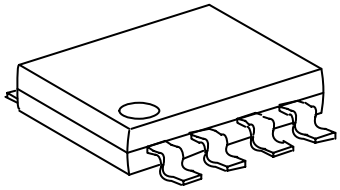
BURST MODE CONTROL IC

GENERAL DESCRIPTION

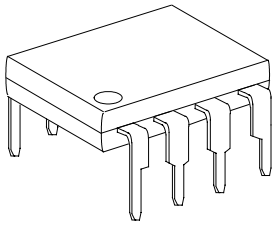
The **FP5132A** is a burst mode signal control IC for backlight inverter applications field. The **FP5132A** includes a low frequency open collector output stage for PWM control IC, positive dimming signal input comparing with oscillator, a shutdown input for monitor the lamp terminal abnormal feedback signal, an output **5.0V** precision reference supply.

FEATURES

- Wide supply voltage operating range: 6.5 to 30V
- Dimming input control
- Fixed Reference Voltage: 5.0V
- Low oscillator frequency: 50Hz ~ 1KHz
- Shutdown detection input
- Open collector output
- Package: SOP8/PDIP8



SOP8

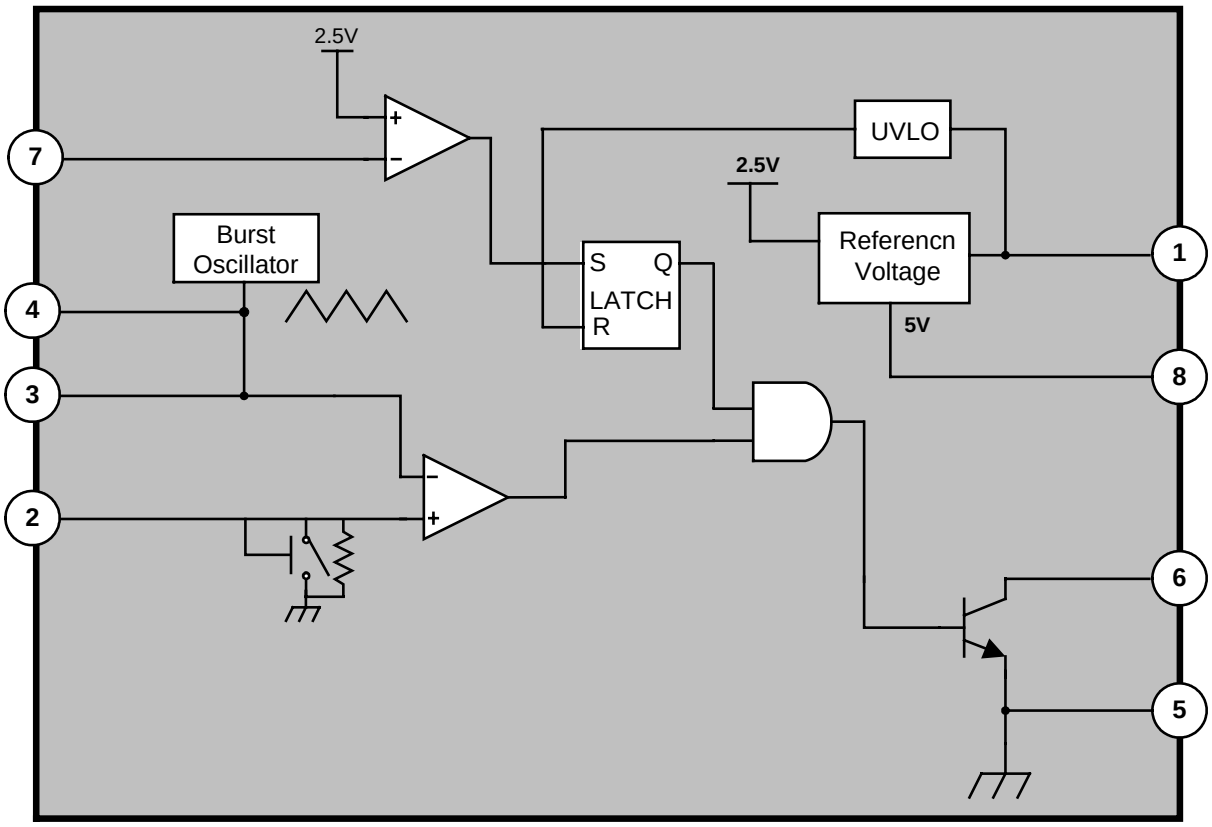


PDIP8

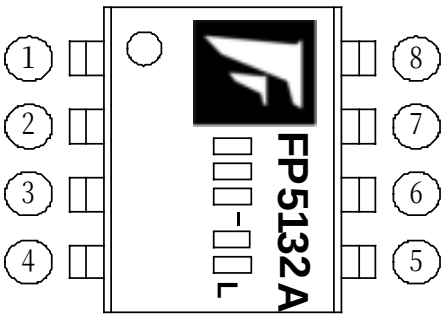
TYPICAL APPLICATION

- PDA backlight inverter
- TFT-LCD backlight inverter
- Notebook backlight inverter

FUNCTIONAL BLOCK DIAGRAM



MARKVIEW



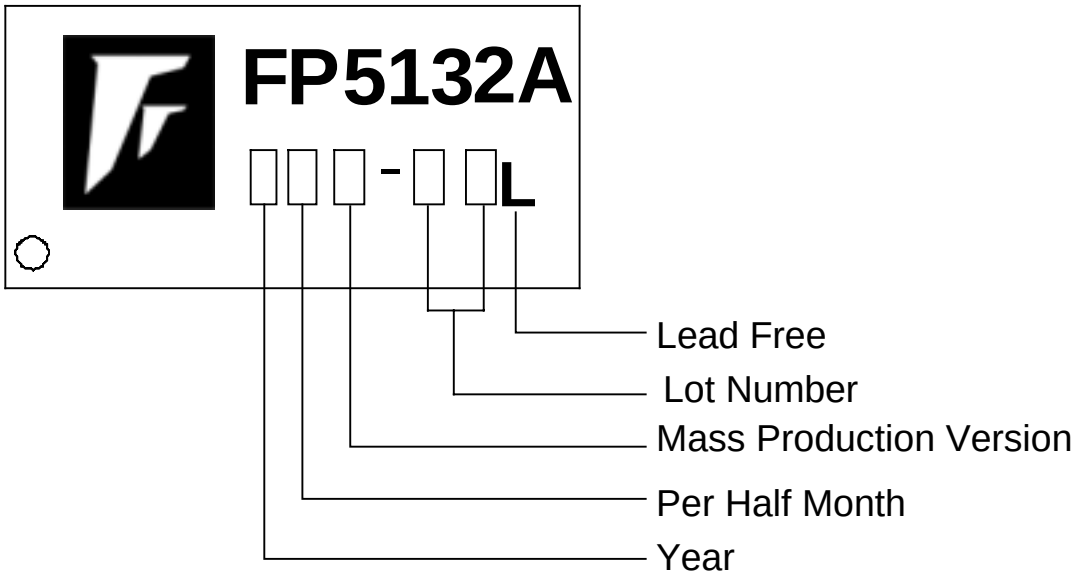
PIN DESCRIPTION

Name	No.	Status	Description
VCC	1	P	IC power supply
DIM+	2	I	Positive dimming input
CT	3	I	Connect a Capacitor for Oscillator
RT	4	I	Connect a Resistor for Oscillator
GND	5	P	IC ground
OUT	6	O	Low frequency OC output
SHDN	7	I	Shutdown detection input
VREF	8	O	5V Reference Voltage

ORDER INFORMATION

Part Number	Operating Temperature	Package	Description
FP5132AD-LF	-20°C ~ +85°C	SOP8	Tube
FP5132ADR-LF	-20°C ~ +85°C	SOP8	Tape & Reel
FP5132AP-LF	-20°C ~ +85°C	PDIP8	Tube

IC DATE CODE DISTINGUISH

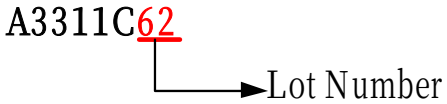


FOR EXAMPLE:

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:



ABSOLUTE MAXIMUM RATINGS

Supply Voltage (Vcc) ---------- +30V

Collector Output Voltage (Vo) ---------- +30V

Collector Output Current (Io) ---------- +5mA

Maximum Junction Temperature (T_j) ---------- +150℃

Thermal Resistance Junction to Ambient (SOP package)---------- 175℃/W

(PDIP package)---------- 100℃/W

Power Dissipation (SOP8 package)

Ta=25℃ ---------- 650mW

Ta=70℃ ---------- 550mW

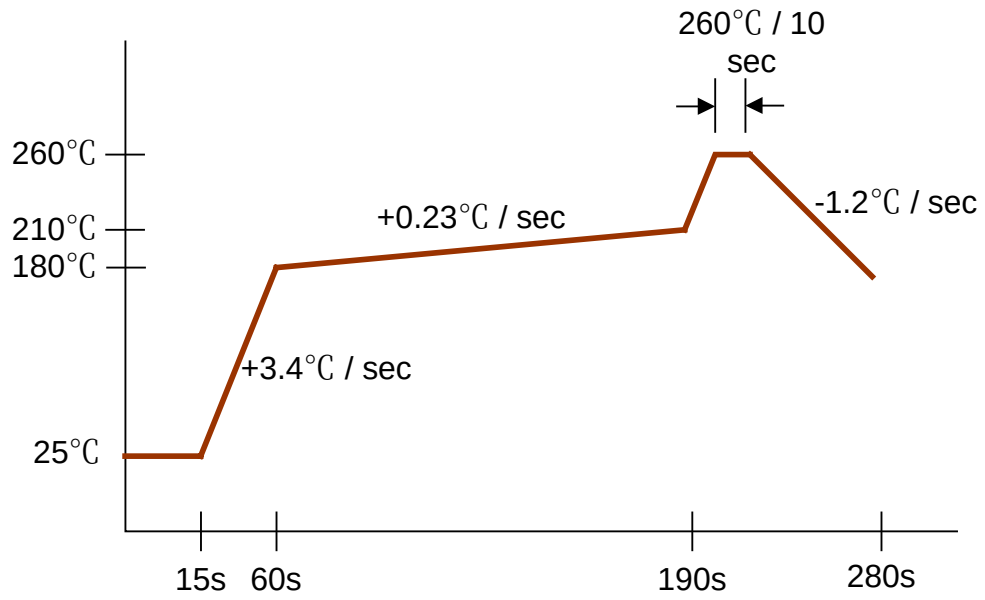
Operating Temperature Range ---------- -20℃ 85℃

Storage Temperature Range ---------- -65℃ 150℃

SOP8 Lead Temperature (soldering, 10 sec) ---------- +260℃

PDIP8 Lead Temperature (soldering, 20 sec) ---------- +260℃

Recommend: IR Reflow



IR Re-flow Soldering Curve

ELECTRICAL CHARACTERISTICS

Electrical characteristics over recommended operating temperature range, VCC＝8V

Reference section

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output voltage (pin 8)	V_{REF}	I_O=1mA	4.90	5	5.1	V
Output voltage change with Temperature	$\triangle V_{REF}$ /$\triangle$T	T_A=-20℃ to 85℃		-0.2	±1	%
Input voltage regulation	$\triangle V_{REF}$ /V_{CC}	Vcc=6.5V 30V	3	5	12.5	mV
Output voltage regulation	$\triangle V_{REF}$ /$\triangle I_O$	Io = 0.1mA to 3 mA	3	5	7.5	mV

Oscillator Section

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Frequency	f	CT=6.8nF,RT=100KΩ	230	250	270	Hz
Frequency change with voltage	$\triangle$f /$\triangle$V	VCC=6.5V to 30V		1		%
Frequency change with temperature	$\triangle$f /$\triangle$T	T_A=-20℃ to 85℃		2		%
Oscillator voltage	V_{RT}	RT=100KΩ	0.53	0.55	0.57	V
Oscillator charge / discharge ratio	Charge/Discharge	CT=6.8nF,RT=100KΩ	0.9	1.05	1.2	-

Output Section

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output saturation voltage	V_{SAT}	I_O＝3mA		0.15	0.2	V

Dimming input section

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Dimming input (PWM Active High)	Dim-	Zero Duty Cycle	0.97	1.0	1.03	V
		Maximum Duty Cycle	2.9	3.0	3.1	V

Shutdown Section

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Shutdown Threshold voltage	V_{SHND}		2.4	2.5	2.6	V

Total device

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Standby supply current	I_{AVE}		1.0	1.5	2.0	mA

†All typical values are at T_A＝25℃.

TYPICAL CHARACTERISTICS

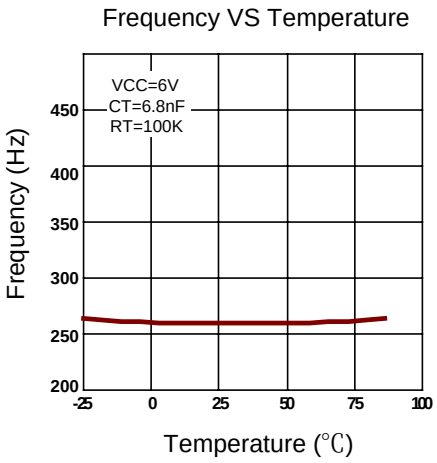


Figure 1

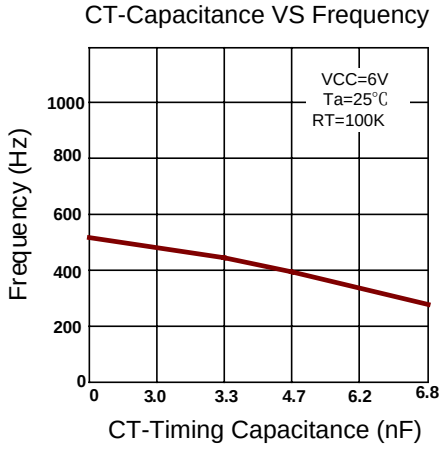


Figure 2

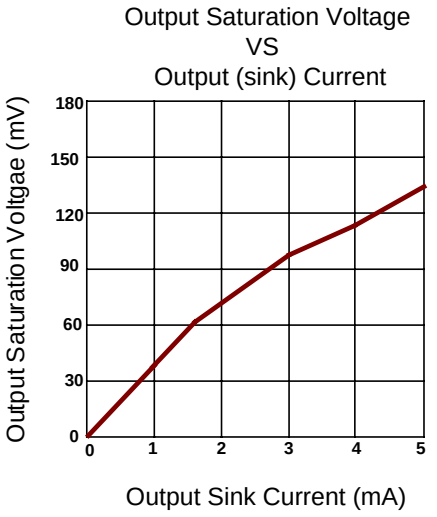


Figure 3

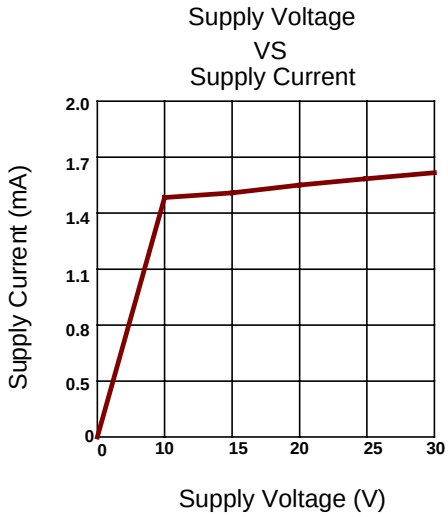


Figure 4

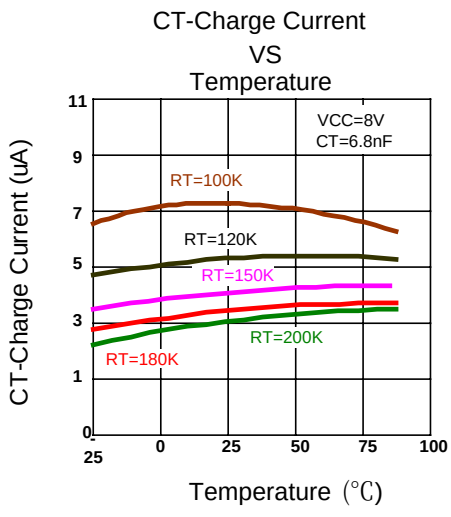


Figure 5

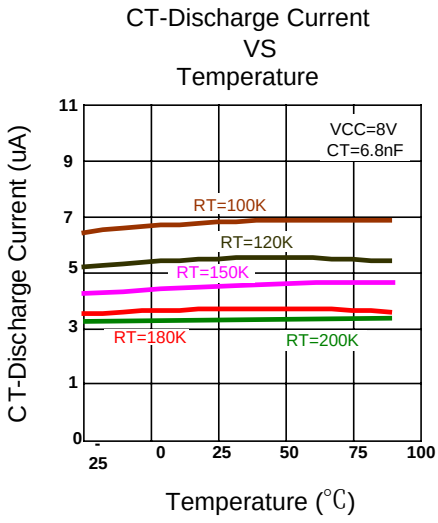
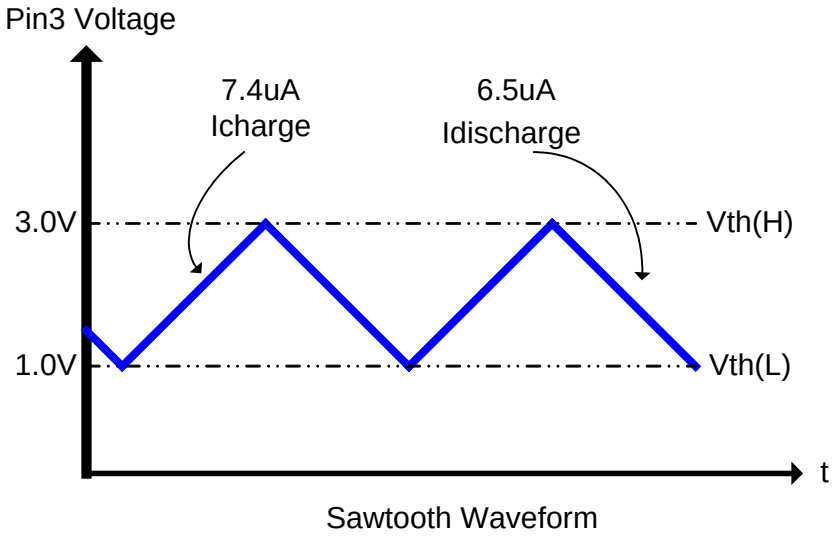


Figure 6

DETAILED DESCRIPTION

Oscillator

The oscillation frequency is a sawtooth waveform, the **FP5132A** charge current and discharge current is determined by an external resistor that is connected to **FP5132A** pin4, the frequency compares with the threshold voltage, using the below formula for the oscillation frequency calculation.



FP5132A oscillation waveform

The oscillation frequency formula:

$$I_{charge} = 1.24 * \frac{V_{RT}}{RT} \quad ; \quad I_{discharge} = 0.95 * I_{charge}$$ -- Equation 1

$$f = \frac{I_{charge} * I_{discharge}}{CT * (V_{th}(H) - V_{th}(L)) * (I_{charge} + I_{discharge})}$$ --- Equation 2

For example:

RT=100KΩ, CT=6.8nF and VRT is 0.565V, the oscillation frequency is:

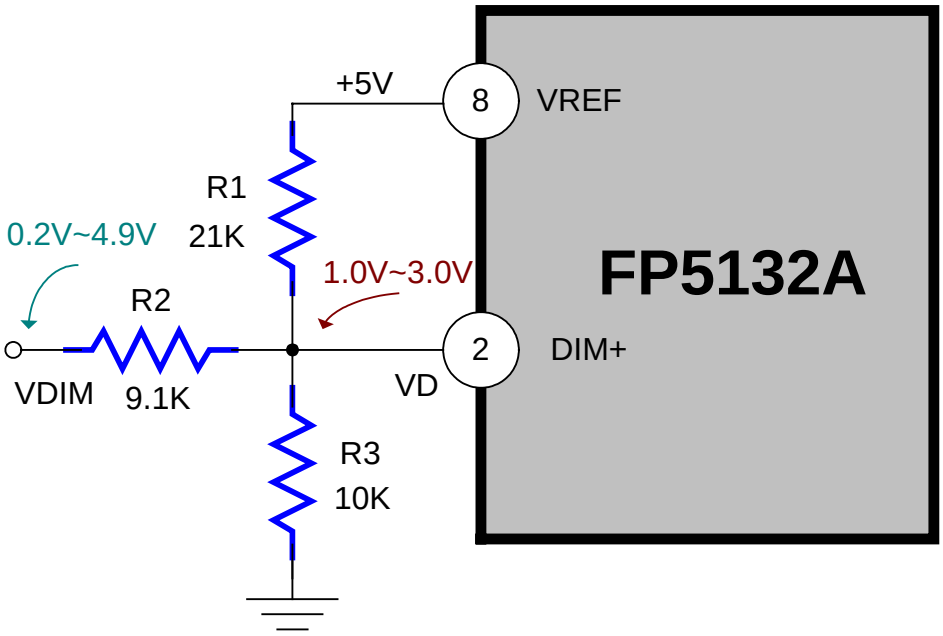
From equation 1, the charge and discharge current are:

I_{charge}=7.006 μA, $I_{discharge}$=6.655 μA then using equation 2:

$$f = \frac{7.006\mu A * 6.655\mu A}{6.8nF * (3.0V - 1.0V) * (7.006\mu A + 6.655\mu A)} = 250.955Hz$$

Voltage reference

A 5.0V reference regulator supplies **FP5132A** internal circuits and uses the resistive dividers to provide a wide range dimming control range, the **FP5132A** typical dimming voltage range is between 1.0V and 3.0V, If the external input range is from 0.2V to 4.9V, it is calculated by the principle of superposition, the application circuits is shown as below:



The wide dimming adjust voltage VDM of superposition principle equation is:

$$VD = \frac{R1 // R3}{R2 + R1 // R3} VDIM + \frac{R2 // R3}{R1 + R2 // R3} VREF$$ -- Equation 3

For example:

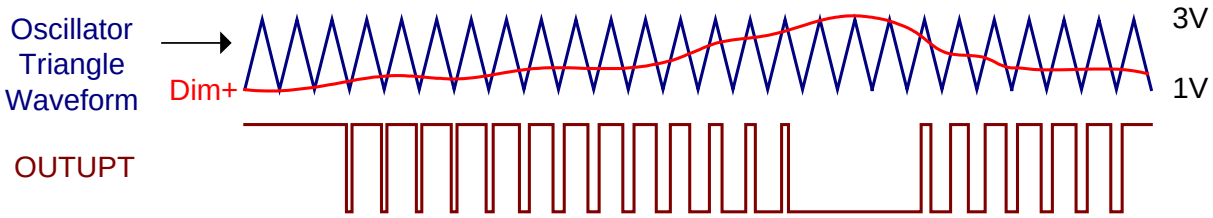
The Conditions are:

VDIM=0.2V, VD=1.0V and VDIM=4.9V, VD=3.0V

choice R3=10KΩ, and using equation 3 to solve the R2=9.2KΩ(use 9.1KΩ) and the R1=21.39KΩ(use 21KΩ)

Dimming and open collector PWM output

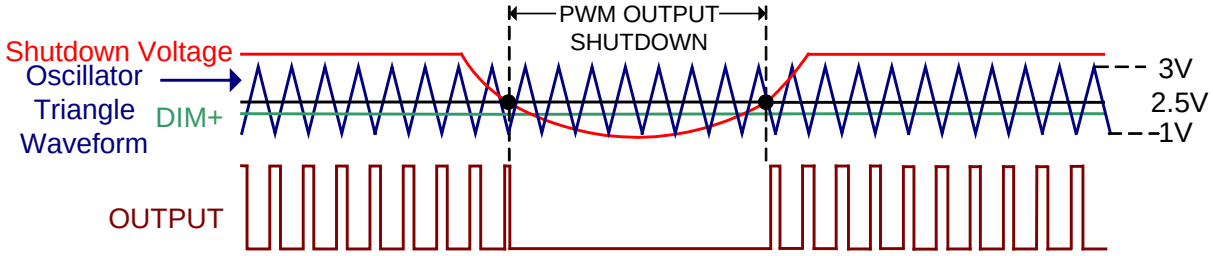
The dimming input (DIM-) of **FP5132A** compares with oscillation frequency, and the PWM output duty cycle change of **FP5132A** depends on the dimming input voltage level that shows below:



Dimming and Output Timing Diagram

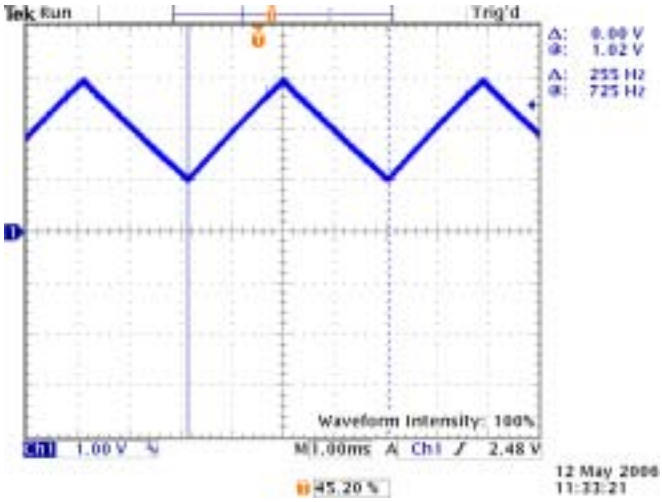
Shutdown

The shutdown function of **FP5132A** is turn-off PWM output when the shutdown voltage of PIN7 is under a 2.5V threshold voltage, and if PIN7 voltage is higher than 2.5V again, there is a PWM signal output generation. The basic application function is using for CCFL open or short, the protection signal could pull down PIN7 voltage under 2.5V, and the PWM signal of **FP5132A** output would turn off (internal pull low).

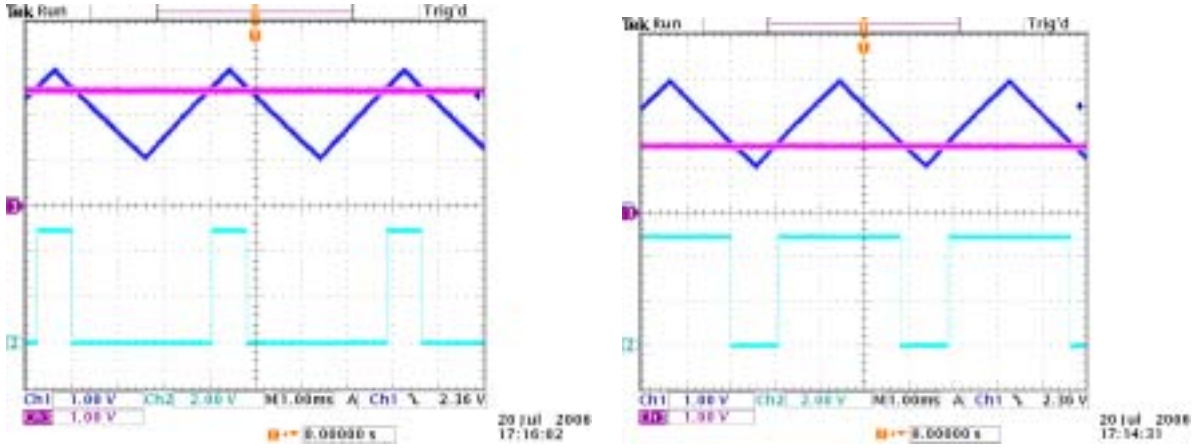


Shutdown and Re-start Timing Diagram

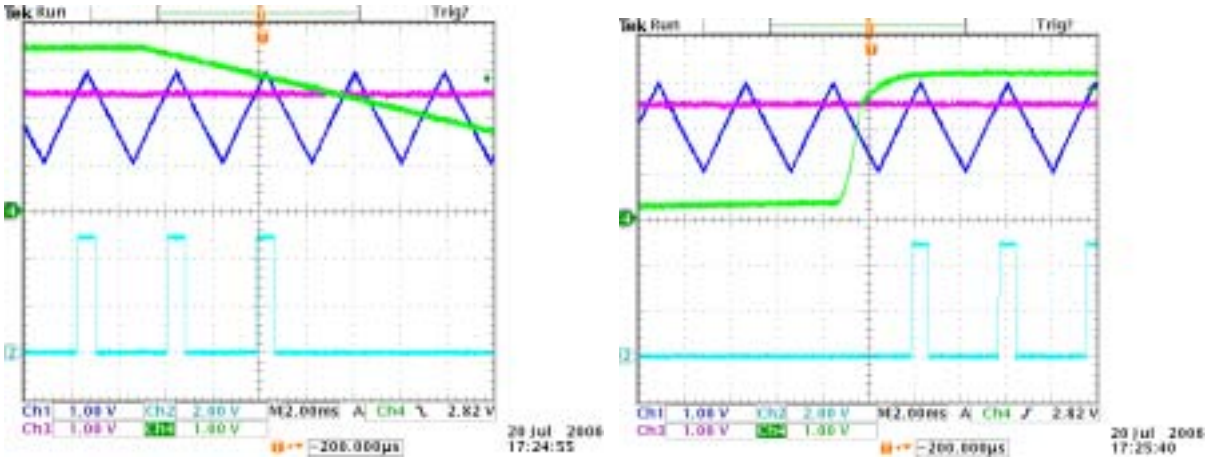
MEASUREMENT WAVEFORM



FP5132A Oscillation Frequency Waveform

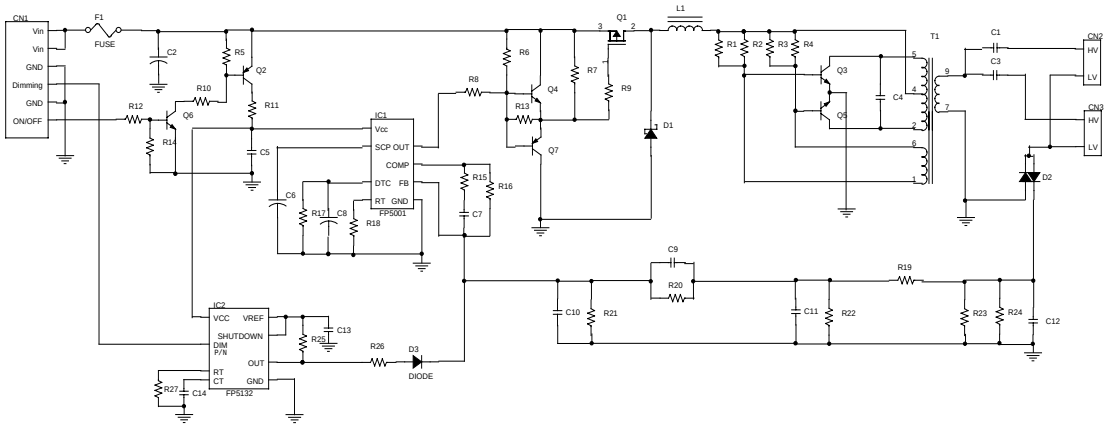


FP5132A Dimming Voltage and PWM Output Waveform



FP5132A PWM Output Shutdown Function Waveform (2.5V Threshold Voltage)

APPLICATION NOTE



2-lamp CCFL Inverter with FP5132A Burst Mode Dimming Control

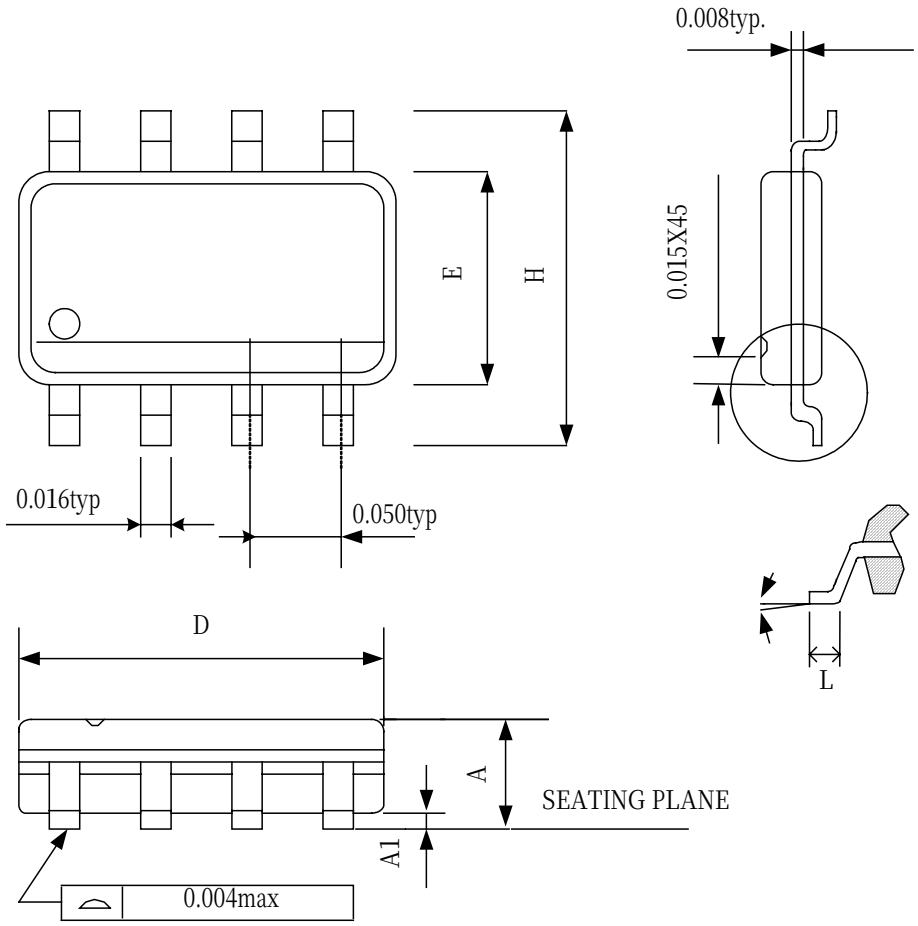
Note

U2 is **FP5132A**, using for a burst mode 1-lamp Royer CCFL inverter with FP5001, the R23-C14 choose the oscillation frequency, and R26-C15 is a simple DIM signal noise rejection filter, the D3 avoids the CCFL feedback signal when burst PWM signal is low state.

The burst PWM voltage must higher than 1.0V VFB voltage for turn-off FP5001 PWM, the bias voltage depends on **FP5132A** burst PWM voltage level and feedback path impendence.

PACKAGE OUTLINE

SOP 8



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

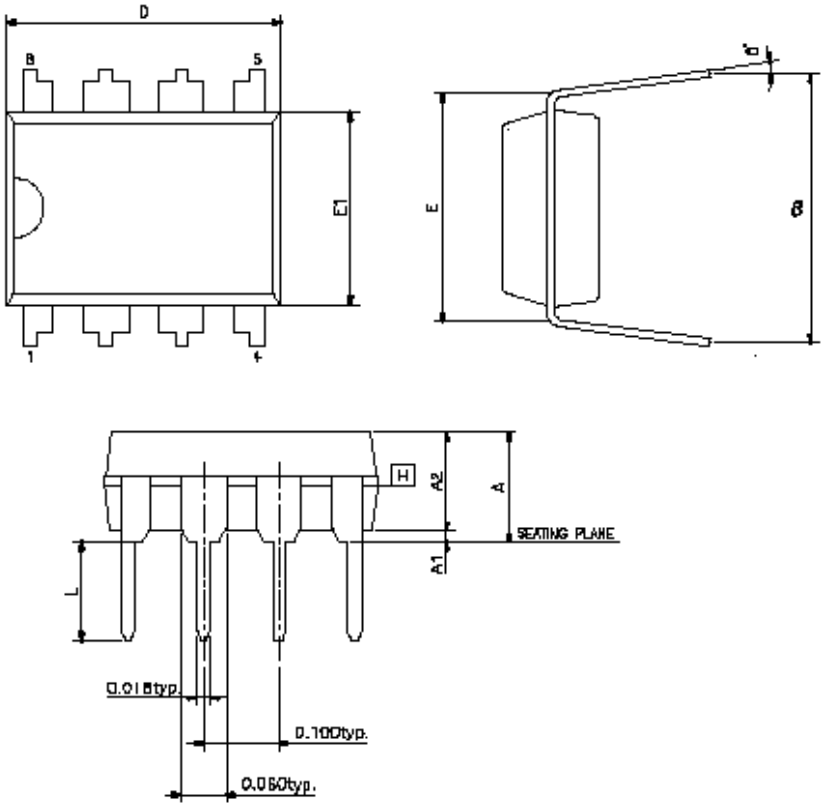
NOTE:

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.

PDIP 8



SYMBOLS	MIN	NOR	MAX
A	-	-	0.210
A1	0.015	-	-
A2	0.125	0.130	0.135
D	0.355	0.365	0.400
E		0.300BSC	
E1	0.245	0.250	0.255
L	0.115	0.130	0.150
e_Θ	0.335	0.355	0.375
Θ°	0	7	15

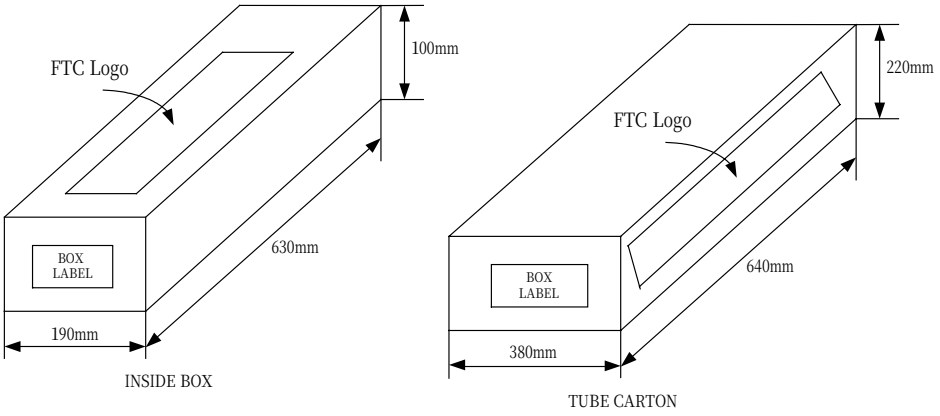
Note:

0. JEDEC OUTLINE:MS-001 BA
1. “D””E1”DIMENSIONS DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED .010 INCH
2. eB IS MEASURED AT THE LEAD TIPS WITH THE LEADS UNCONSTRAINED
3. POINTED OR ROUNDED LEAD TIPS ARE PREFERRED TO EASE INSERTIDN
4. DISTANCE BETWEEN LEADSINCLUDING DAM BAR PROTRUSIONS TO BE .005 INCH MININUM
5. DATUM PLANE H CONINCIDENT WITH THE BOTTOM OF LEAD, WHERE LEAD EXITS BODY.

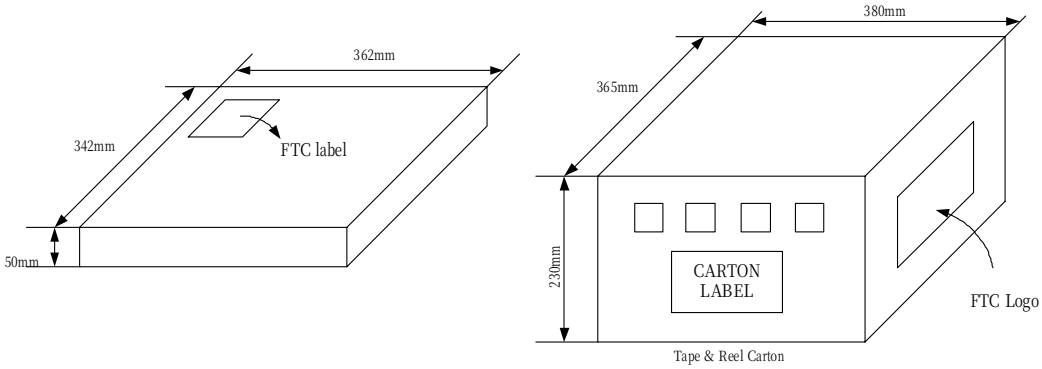
PACKING SPECIFICATIONS

BOX DIMENSION

TUBE INSIDE BOX AND CARTON



TAPE & REEL INSIDE BOX AND CARTON



PACKING QUANTITY SPECIFICATIONS

100 EA / TUBE	2500 EA / REEL
100 TUBES / INSIDE BOX	4 INSIDE BOXES / CARTON
4 INSIDE BOXES / CARTON	

LABEL SPECIFICATIONS

TAPPING & REEL

Feeling Technology Corp.
Product FP5132ADR-LF
Lot No A3311C62
D/C 4Xx-XXL
Q'ty ◎ ◎

無鉛
Lead Free

CARTON

Feeling Technology Corp.

Product Type: FP5132ADR-LF

Lot No: A3311C62

Date Code: 4Xx-XXL

Package Type: SOP-8L

Marking Type: Laser

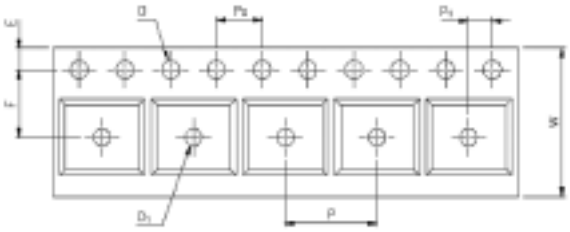
Total Q'ty: 10,000

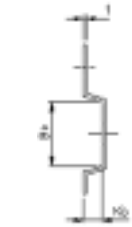
無鉛
Lead Free

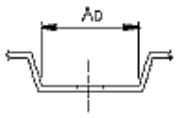
CARRIER TAPE DIMENSIONS

APPLICATION	W	P	E	F	D	D_1
SOP8	$12.0^{+0.3}_{-0.1}$	8.0±0.1	1.75±0.1	5.5±0.1	1.55±0.1	$1.5^{+0.25}$

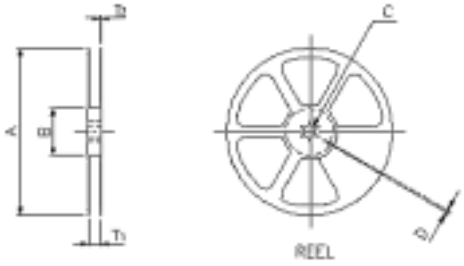
APPLICATION	P_0	P_1	A_0	B_0	K_0	t
SOP8	4.0±0.1	2.0±0.1	6.4±0.1	5.20±0.1	2.1±0.10	0.30±0.013







REEL DIMENISIONS



APPLICATION	MATERIAL	A	B	C	D	T_1	T_2
SOP8	PLASTIC REEL	330±0.1	62±1.5	12.75+0.15	2+0.6	12.4+0.2	2.0+0.2