

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



General Description

The FP6182 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. The regulator only consumes 25 μ A supply current in shutdown mode. The FP6182 requires a minimum number of readily available external components to complete a 2A buck regulator solution.

Features

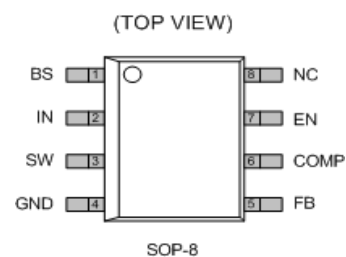
- 2A Output Current
- 0.22 Ω Internal Power MOSFET Switch
- Stable with Low ESR Output Ceramic Capacitors Up to 95% Efficiency
- 25 μ A Shutdown Mode Current
- Fixed 380KHz frequency
- Thermal Shutdown
- Cycle-by-Cycle Over Current Protection
- Wide 4.75 to 23V Operating Input Range
- Output Adjustable From 1.222 to 16V
- Available SOP8 Package
- Under Voltage Lockout



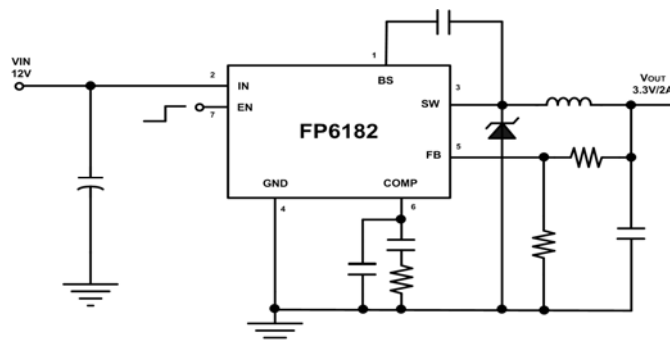
Applications

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

Pin Configurations

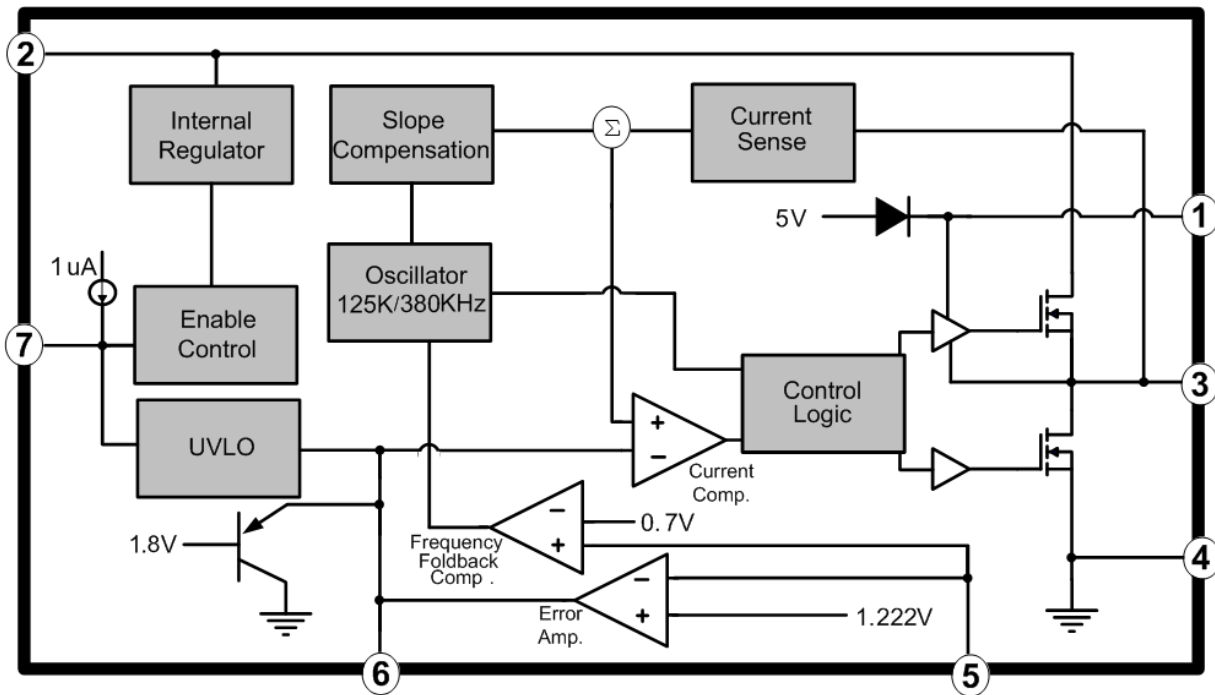


Typical Application Circuit



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Function Block Diagram



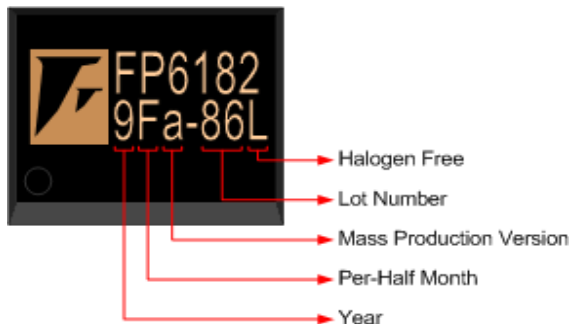
Marking View



Pin Descriptions

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
NC	8	-	NC

IC Date Code Distinguish



NOTE:

Lot Number
(It is the last two numbers of wafer lot number.)

Example:
132371TB → 71

Per-Half Month

Example:
January → A(Front Half Month),B(Last Half Month)
February → C(Front Half Month),D(Last Half Month)

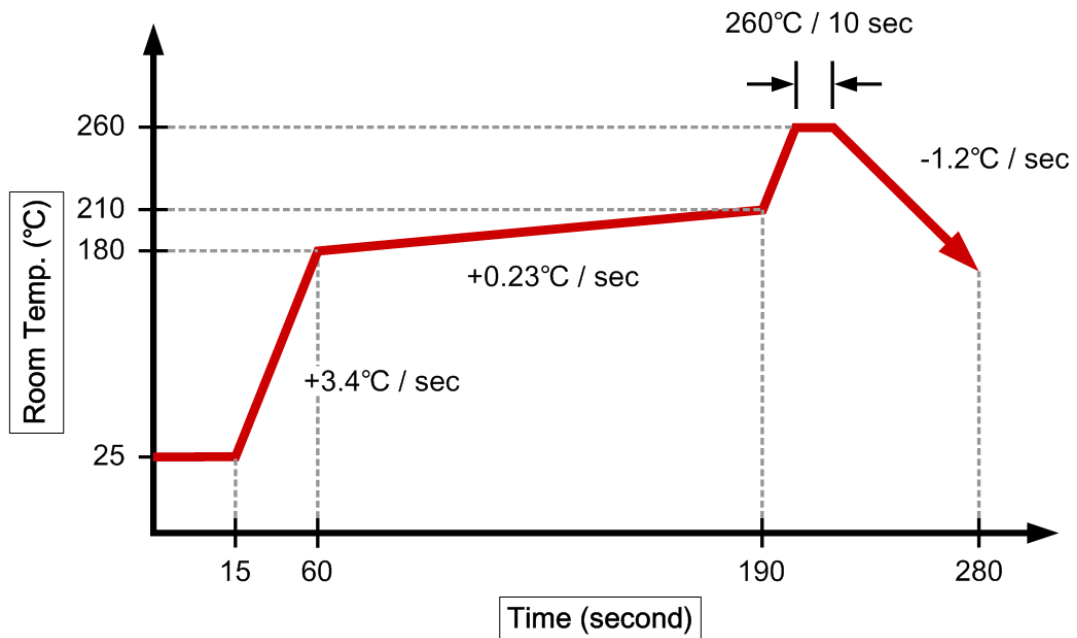
Order Information

Part Number	Operating Temperature	Package	Description
FP6182DR-G1	-40°C ~ +85°C	SOP8	Tape & Reel
FP6182D-G1	-40°C ~ +85°C	SOP8	Tube

Absolute Maximum Ratings

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply Voltage	V_{IN}	-	-0.3		24	V
Supply Voltage	V_{SW}	-	-1		$V_{IN} + 0.3$	V
Bootstrap Voltage	V_{BS}	-	$V_{SW} - 0.3$		$V_{SW} + 6$	V
All Other Pins		-	-0.3		6	V
Junction Temperature	T_J	-			150	°C
Storage Temperature	T_S	-	-65		-150	°C
Allowable Power Dissipation		SOP8			570	mW
Thermal Resistance	θ_{JA}	SOP 8		110		°C/W
Lead Temperature(soldering, 10 sec)		SOP 8		260		°C

IR Re-flow Soldering Curve



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Recommended Operating Conditions

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply Voltage	V_{IN}	-	4.75	-	23	V
Operating Temperature		-	-40	-	85	°C

Electrical Characteristics (Ta= 25°C, $V_{IN}=12V$, unless otherwise noted)

Parameter	Symbol	Test Conditions	Min	Typ.	Max	Unit
Standby Current	I_{SB}	$V_{EN} \geq 3V, V_{FB} \geq 1.5V$		1.0	1.5	mA
Shutdown Supply Current	I_{ST}	$V_{EN}=0$		25	50	μA
Feedback Voltage	V_{FB}	$V_{IN}=12V, V_{COMP}<2V$	1.184	1.222	1.258	V
High Side Switch ON Resistance	R_{ON-HS}			0.22		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}		2.8	3.4	4.7	A
Oscillation Frequency	f_{OSC}			380		KHz
Short Circuit Oscillation Frequency	f_{SC}	$V_{FB}=0V$		125		KHz
Maximum Duty Cycle	D_{MAX}	$V_{FB}=1.0V$		90		%
Minimum Duty Cycle	D_{MIN}	$V_{FB}=1.5V$			0	%
Under Voltage Lockout Threshold	V_{UVLO}	V_{EN} Rising	2.0	2.5	3.0	V
Under Voltage Lockout Threshold Hysteresis	V_{HYS}			200		mV
EN Threshold Voltage	V_{EN}	$I_{CC} > 100\mu A$	0.7	1.0	1.3	V
Enable Pull Up Current	I_{EN}	$V_{EN}=0V$		1.0		μA
Thermal Shutdown	T_{TS}			140		°C

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Typical Operating Characteristics

(Ta= 25°C, VIN=12V, unless otherwise noted)

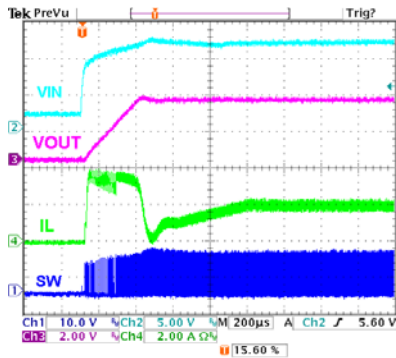


Figure1: Power on

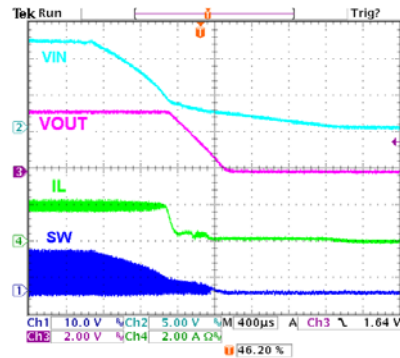


Figure2: Power off

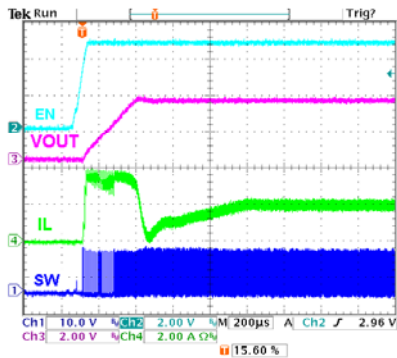


Figure3: EN Pin Enable

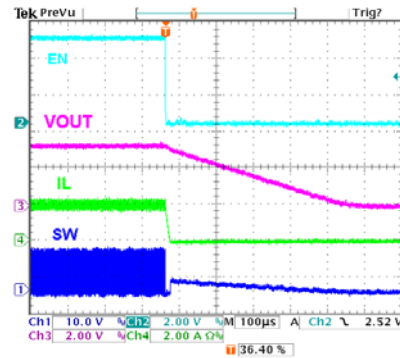


Figure4: EN Pin Disable

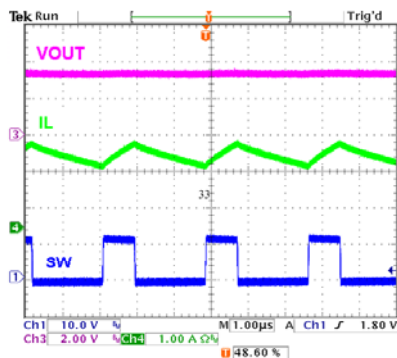


Figure5: Load2A

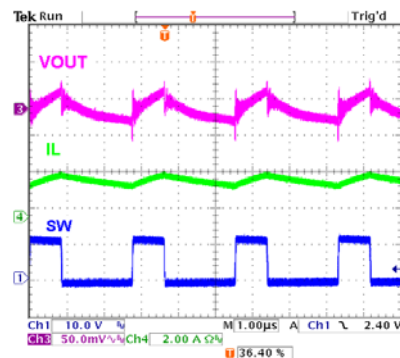


Figure6: Load2 A Ripple

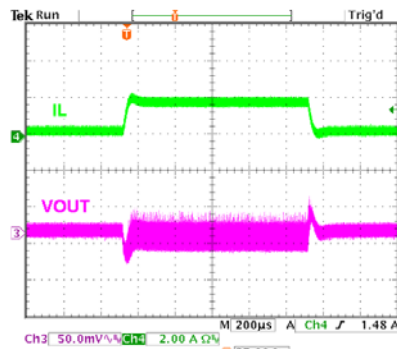


Figure7: Load Step

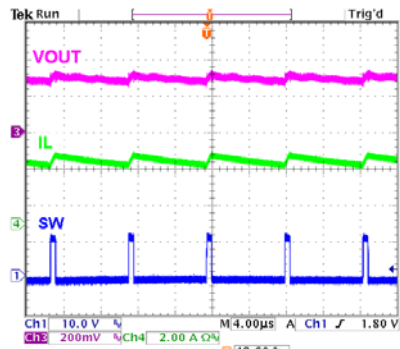


Figure8: SCP Action

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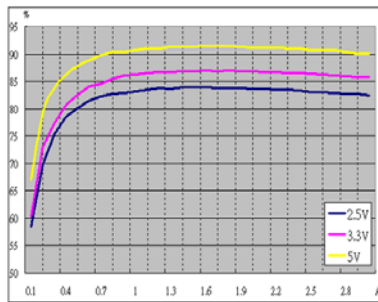


Figure 9 : Efficiency vs Load (Vin=10V)

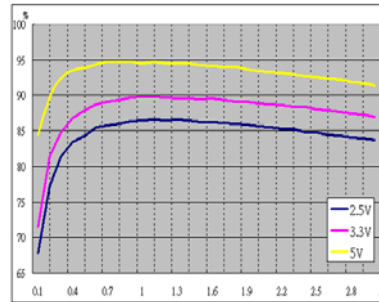


Figure10 : Efficiency vs Load (Vin=7V)

Function Description

The FP6182 is a current-mode buck regulator. It regulates input voltages from 4.75V to 23V down to an output voltage as low as 1.222V, and is able to supply up to 2A of load current. The FP6182 uses current-mode control to regulate the output voltage. The output voltage is measured at FB through a resistive voltage divider and amplified by 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 connected between SW and 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:

$$V_{FB} = V_{OUT} \times R_2 / (R_1 + R_2)$$

Thus the output voltage is:

$$V_{OUT} = 1.222 \times (R_1 + R_2) / R_2$$

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

Enable Mode / Shutdown Mode

The FP6182 has both enable and shutdown modes that are controlled by the EN pin. Connecting a voltage source greater than 3.0V to the EN pin enables the operation of FP6182, while reducing this voltage below 0.7V places the part in a low quiescent current (25uA typical) shutdown mode.

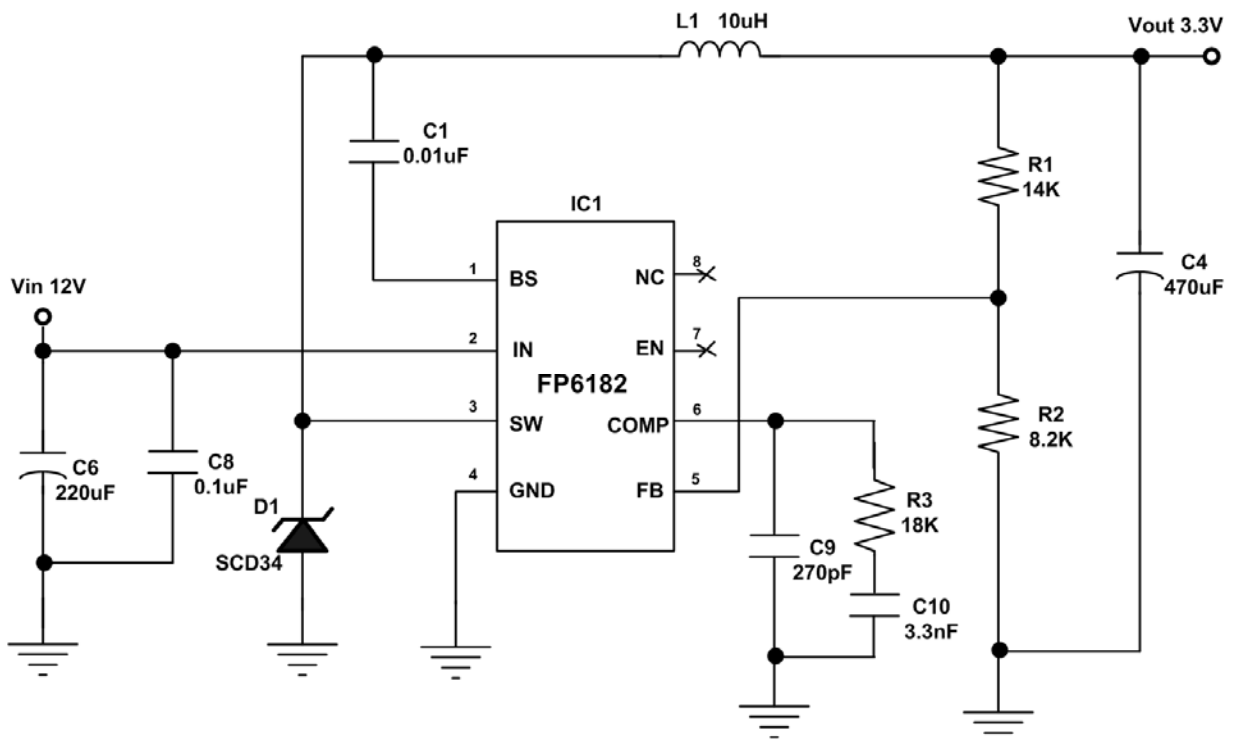
Boost High-Side Gate Drive (BST)

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 internal regulator. On startup, an internal low-side switch connects SW to ground and charges the BST capacitor to internal 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.

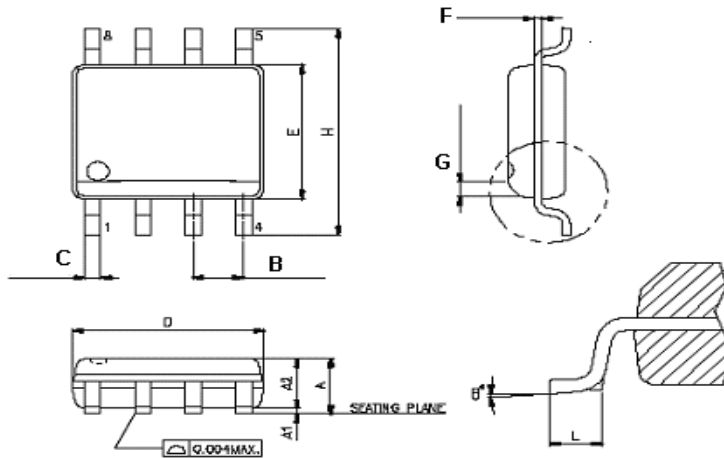
Thermal Shutdown Protection

The FP6182 features integrated thermal shutdown protection. When the IC junction temperature exceeds +140°C, thermal shutdown protection will be triggered. The internal power MOSFET is then turned off to limit the device power dissipation (P_D). Once thermal shutdown occurs, this device can go back to normal operation until the junction temperature drops below +110°C approximately.

Application Information



Package Outline
SOP8



Symbols	Min.	Max.
A	1.346	1.752
A1	0.101	0.254
A2	-	1.498
B	1.27 BSC.	
C	0.4064 BSC.	
D	4.800	4.978
E	3.810	3.987
F	0.2032 BSC.	
G	0.381×45°BSC.	
H	5.791	6.197
L	0.406	1.270
θ°	0	8

UNIT:mm

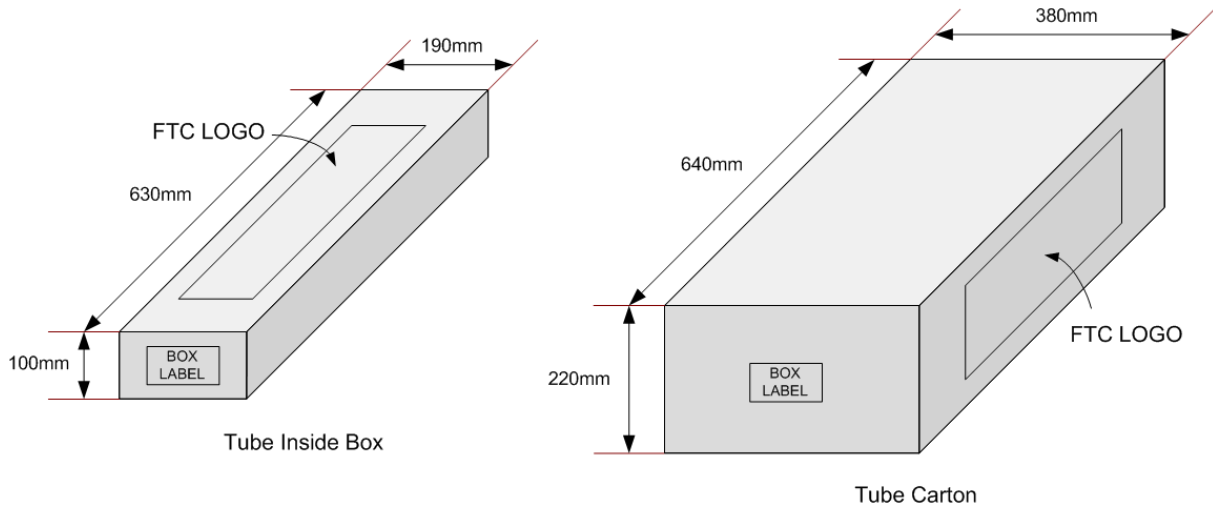
Note:

1. JEDEC OUTLINE:N/A
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.

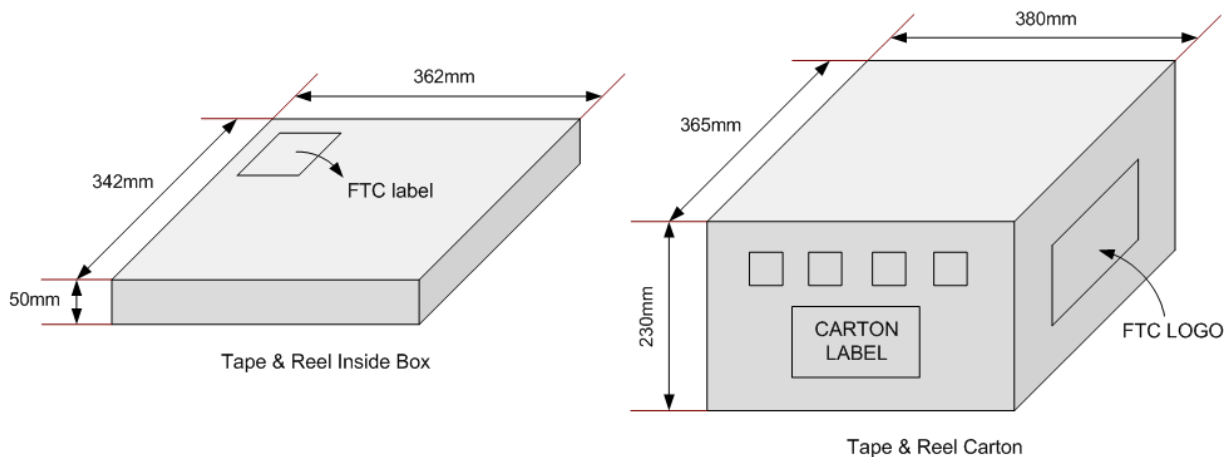
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Packing Specifications

Box Dimension



Tube Inside Box and Carton



Tape & Reel Inside Box and Carton

Packing Quantity Specifications

FP6182-XX-LF SOP8	FP6182-XXR-LF SOP8
100 ea/Tube	2500 ea / Reel
100 Tubes / Inside Box	1 Reel / Inside Box
4 Inside Boxes / Carton	4 Inside Boxes / Carton

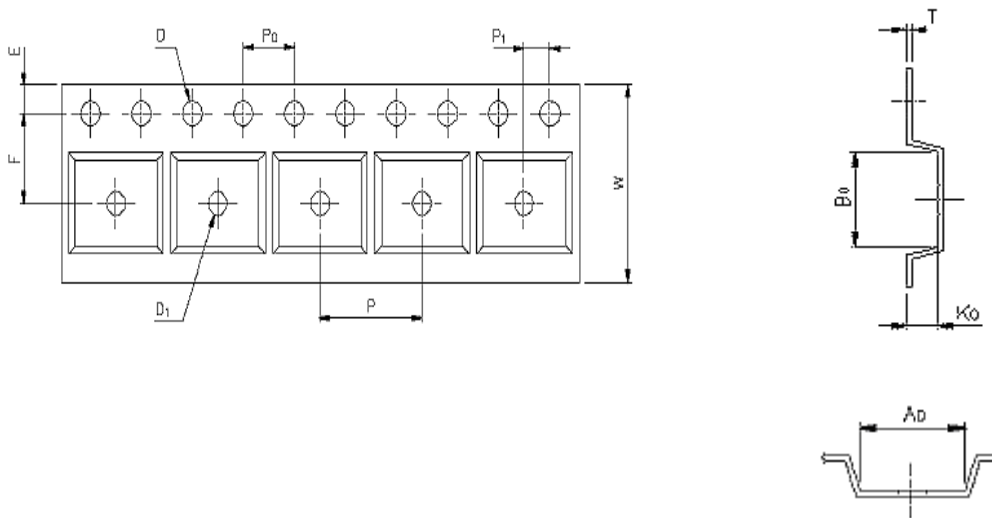
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Carrier Tape Dimensions SOP8

Application	W	P	E	F	D	D1
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 _D	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

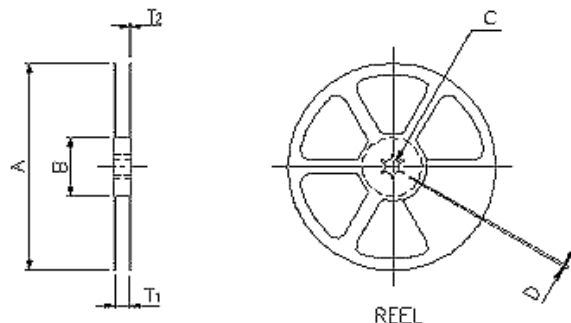
UNIT:mm



Reel Dimensions

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

UNIT:mm



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