



## ***Six-String White LED Driver with Dynamic Output Voltage Control for LCD Panel Backlight***

### **Description**

The FP6742 is a high efficiency driver for white LEDs. It is mainly designed for large LCD panels that employ an array of LEDs as backlight source. A step-up current mode PWM DC/DC converter with built-in power MOSFET drives up to six parallel strings of multiple series-connected LEDs.

The FP6742 features dynamic output voltage control function, which automatically chooses the lowest active LED sense voltage to regulate the feedback voltage of step-up converter. Through the function, the FP6742 is able to dynamically adjust output voltage of step-up converter to optimize the system power efficiency.

The internal step-up converter provides soft-start feature which is determined by external compensation network. The switching frequency is programmable by an external resistor to provide users flexibility in application. In shutdown mode, current consumption can be reduced to only 1uA. It converts the input voltage ranged from 4.5V to 25V into an output voltage up to 40V.

The FP6742 also provides six channel constant current sinks with maximum  $\pm 3\%$  current matching. The LED current can be adjusted by an external resistor, which provides users flexibility to control the light intensity of LEDs. In addition, users can precisely adjust LED brightness from 0% to 100% via PWM pin with pulse width modulation.

The FP6742 has multiple features to protect the converter from fault conditions. To protect the step-up converter when the load is open, the adjustable over-voltage protection (OVP) function is provided. The converter features cycle-by-cycle current limit to ensure the system reliability and provide consistent operation. FP6742 also features thermal protection function which could against any combination of overload or ambient temperature that could exceed junction temperature.

FP6742 is available in low-profile, space-saving thermal enhanced 20-pin TSSOP exposed pad and TQFN 4mm x 4mm packages.

### **Features**

- Operating Voltage from 4.5V to 25V
- Output Voltage from Input Voltage to 40V
- Dynamic Output Voltage Control to Optimize System Efficiency
- 90% Efficiency for Boost Converter
- Integrated Power MOSFET for Boost Converter
- Programmable Switching Frequency
- Soft Start Function
- External Compensation Network
- Six Constant Current Output Sink Channels
- LED Current Set by an External Resistor.
- Output Current Matching :  $\pm 3\%$  (max.) between Channels
- LED Brightness Dimming by External PWM Signal.
- Adjustable Over-Voltage Protection
- Over-Temperature Protection
- RoHS Compliant

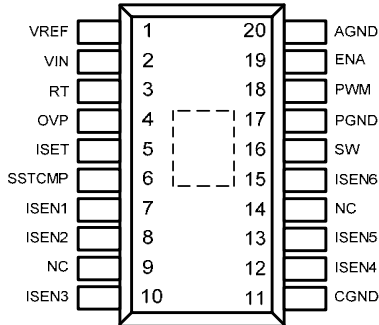
### **Applications**

- Medium Size LCD Panel LED Backlight Drivers
- Notebook, Subnotebook, and Tablet Computer Displays
- Industrial Displays

**FITIPOWER DCG  
CONTROL COPY**

### Pin Assignments

#### TP Package (TSSOP-20 <Exposed Pad>)



#### WQ Package (TQFN-20, 4mm x 4mm)

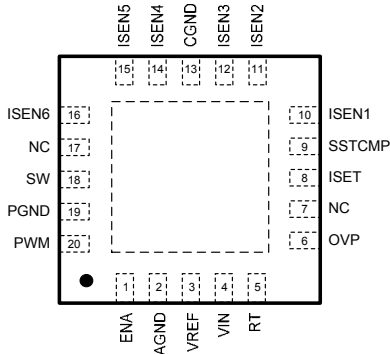


Figure 1. Pin Assignment of FP6742

### Ordering Information

#### FP6742

- TR: Tape / Reel
- Blank: Tube
- P: Pb Free with Commercial Standard (RoHS Compliant)
- Package Type
- TP: TSSOP-20 (Exposed Pad)
- WQ: TQFN-20 (4X4)

### Typical Application Circuit

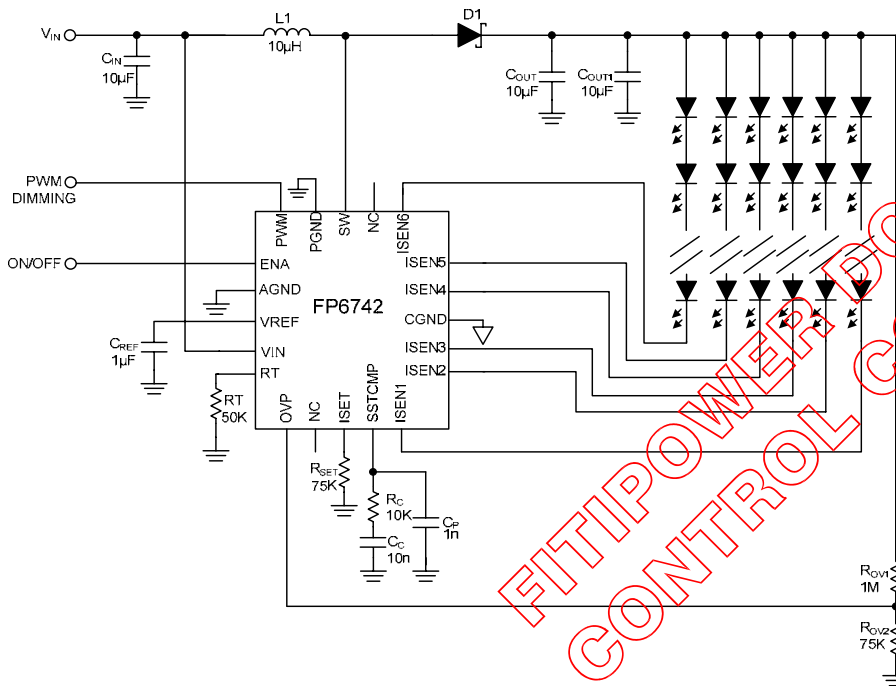


Figure 2. Typical Application Circuit of FP6742

## Functional Pin Description

Pin Name	Pin Function
<b>ENA</b>	Enable pin. Pull this pin low to turn off IC
<b>NC</b>	No connection
<b>VREF</b>	Voltage reference output
<b>VIN</b>	IC power supply pin
<b>RT</b>	Switching frequency setting pin
<b>OVP</b>	Over-voltage and over-drive protection threshold setting pin
<b>ISET</b>	Pin used to connect an external resistor for setting LED current of each channel
<b>SSTCMP</b>	Soft start and compensation pin
<b>ISEN1</b>	LED current sense for string 1
<b>ISEN2</b>	LED current sense for string 2
<b>ISEN3</b>	LED current sense for string 3
<b>ISEN4</b>	LED current sense for string 4
<b>ISEN5</b>	LED current sense for string 5
<b>ISEN6</b>	LED current sense for string 6
<b>SW</b>	Switching pin
<b>PWM</b>	PWM signal input pin for dimming control
<b>CGND</b>	Constant current sinks power ground
<b>PGND</b>	Boost converter power ground
<b>AGND</b>	Analog ground.

FITIPOWER DCC  
 CONTROL COPY

### Block Diagram

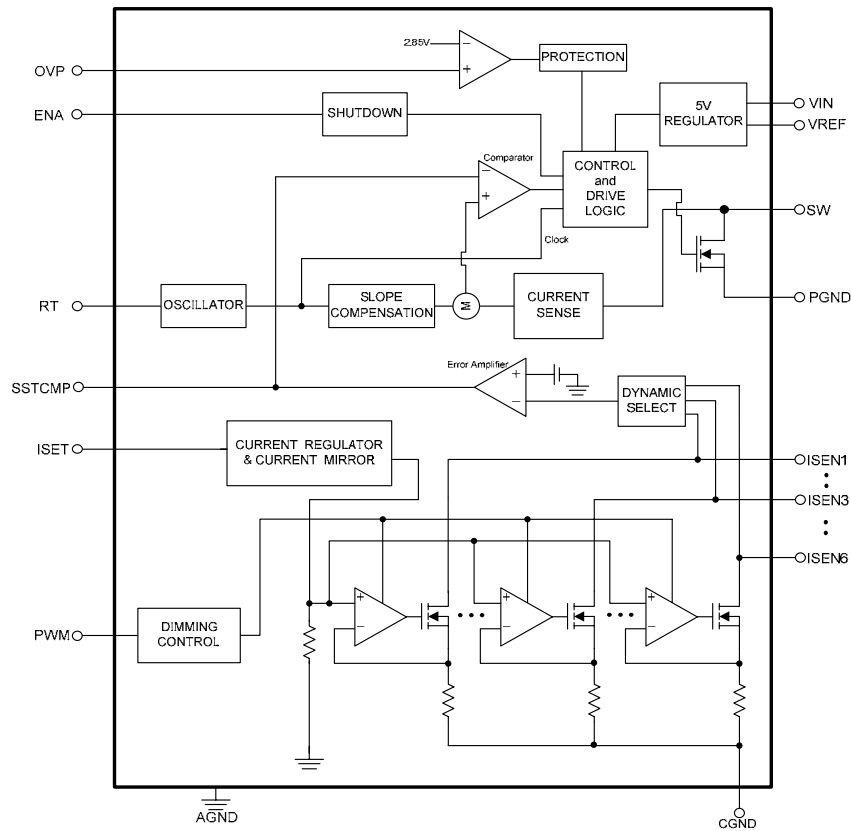


Figure 3. Block Diagram of FP6742

### Absolute Maximum Ratings

- VIN to GND----- 28V
- SW to GND----- -0.3V to +45V
- ISEN1~ISEN6 to GND----- -0.3V to +45V
- ENA, VREF, RT, OVP, ISET, SSTCMP, PWM to GND----- -0.3V to +6V
- Continuous Power Dissipation (TA=+70°C) TSSOP-20 (Exposed Pad)----- 1.38W
- Continuous Power Dissipation (TA=+70°C) TQFN-20 4mmx4mm----- 1.1W
- Package Thermal Resistance, TSSOP-20 (Exposed Pad) (θJA)----- 40°C/W
- Package Thermal Resistance, TQFN-20 4mmx4mm (θJA)----- 50°C/W
- Junction Temperature----- +150°C
- Storage Temperature Range----- -65°C to +150°C
- Lead Temperature (Soldering, 10sec.)----- 260°C

Note : Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device.

### Recommended Operating Conditions

- Supply Voltage, VIN----- 4.5V to 25V
- Boost Converter Output Voltage----- 40V
- Operation Temperature Range----- -40°C to +85°C



## Electrical Characteristics

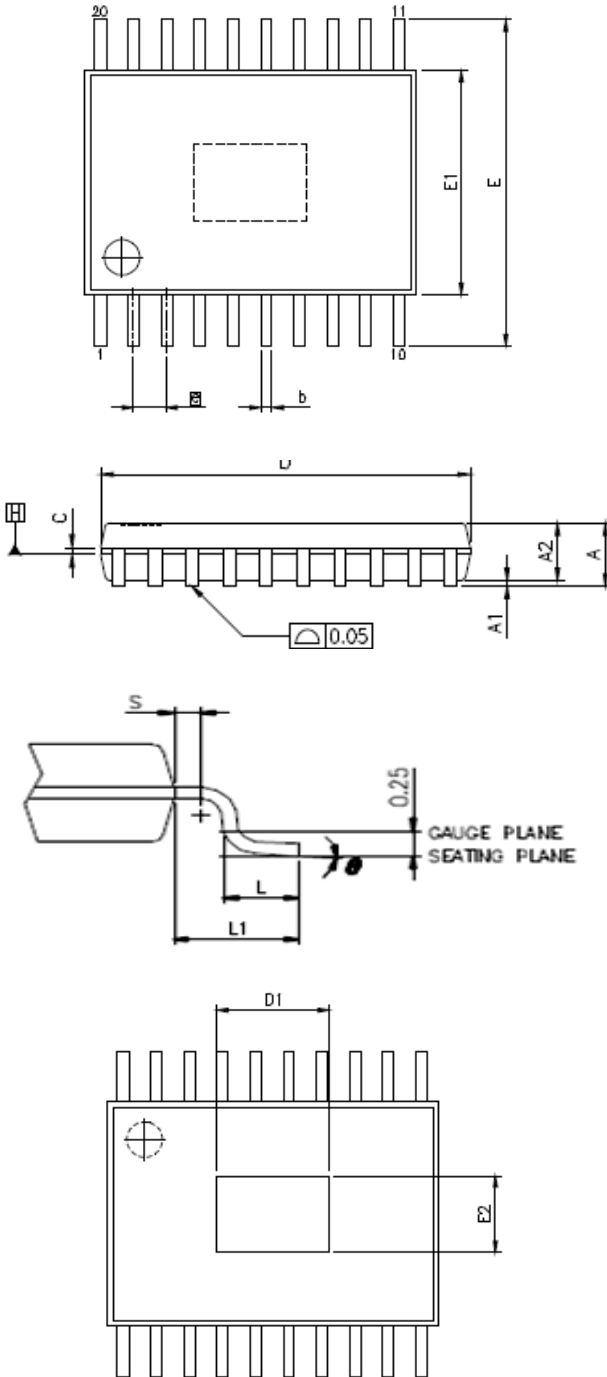
(V<sub>IN</sub>=12V, V<sub>ENA</sub>=5V, RT=50KΩ, RSET=75KΩ, T<sub>A</sub>=25°C, unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
<b>INPUT</b>						
Operation Voltage Range	V <sub>IN</sub>		4.5		25	V
VREF Under-Voltage Lockout	V <sub>UVLO</sub>	V <sub>IN</sub> rising, typical hysteresis is 100mV	3.9	4.25	4.4	V
Operating Current	I <sub>IN</sub>			6		mA
Shutdown Current	I <sub>SD</sub>	V <sub>ENA</sub> =0V		1		μA
<b>REFERENCE</b>						
VREF Voltage	V <sub>REF</sub>			5.0		V
<b>OSCILLATOR</b>						
Operating Frequency	F <sub>OSC</sub>			1.0		MHz
Maximum Duty Cycle	T <sub>DUTY</sub>			95		%
<b>N-CHANNEL SWITCH</b>						
Current Limit	I <sub>LIM</sub>			2.5		A
On-Resistance	R <sub>ON</sub>	I <sub>SW</sub> = 200mA		0.25		Ω
Switch Leakage Current	I <sub>SWOFF</sub>	V <sub>SW</sub> =40V		5		μA
<b>ENABLE CONTROL</b>						
ENA Input High Level	V <sub>ENH</sub>		1.8			V
ENA Input Low Level	V <sub>ENL</sub>				0.9	V
ENA Input Current	I <sub>EN</sub>			0.01		μA
<b>CONSTANT CURRENT SINKS</b>						
Sustaining Voltage at ISEN Pins	V <sub>ISEN(max)</sub>				40	V
ISEN Pins Leakage Current	I <sub>SENOFF</sub>	V <sub>ISEN</sub> =40V		1		μA
Average LED Current	I <sub>LED(avg)</sub>			20		mA
LED Current Balance Rate (Note 1)	dI <sub>LED</sub>			±1	±3	%
<b>PWM DIMMING CONTROL</b>						
Dimming High Level	V <sub>DMH</sub>		1.3			V
Dimming Low Level	V <sub>DML</sub>				0.5	V
<b>CONTROL &amp; PROTECTION</b>						
ISET Voltage	V <sub>ISET</sub>			500		mV
Soft-Start Charge Current	I <sub>SS</sub>			2.5		μA
Over-Voltage Protection Threshold	V <sub>OV</sub>			2.85		V
Thermal Shutdown	T <sub>SD</sub>			160		°C
Thermal Shutdown Hysteresis	Δ T <sub>SD</sub>			25		°C

Note 1 :  $dI_{LED} = \pm \frac{(I_{max} - I_{min})}{2 \times I_{avg}} \times 100\%$

Outline Information

TSSOP-20(Exposed Pad) Package (Unit: mm)



SYMBOLS UNIT	DIMENSION IN MILLIMETER		
	MIN	NOM	MAX
A	---	---	1.20
A1	0.05	---	0.15
A2	0.80	0.90	1.05
b	0.19	---	0.30
C	0.09	---	0.20
D	6.40	6.50	6.6
E1	4.30	4.40	4.50
E	6.40 BSC		
e	0.65 BSC		
L1	1.00 REF		
L	0.50	0.60	0.75
S	0.20	---	---
θ	0°	---	8°

PAD SIZE	DIMENSION IN MILLIMETER	
	E2	D1
118X16E	2.7 REF	3.77 REF

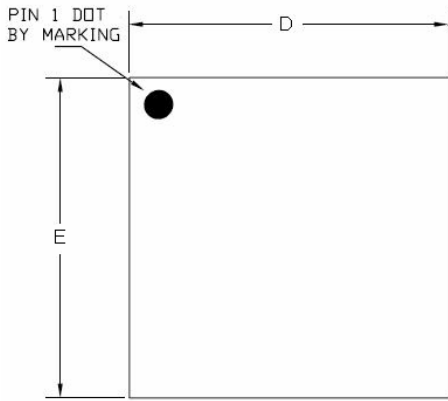
- Note
- JEDEC Outline :
  - MO-153 AD/MO-153 (Thermally Enhanced Variations Only)
  - Dimension "D" Does Not Include Mold Flash, Protrusions Or Gate Burrs. Mold Flash Protrusions Or Gate Burrs Shall Not Exceed 0.15 Per Side.
  - Dimension "E1" Does Not Include Interlead Flash Or Protrusion. Interlead Flash Or Protrusion Shall Not Exceed 0.25 Per Side.
  - Dimension "b" Does Not Include DAMBAR Protrusion. Allowable DAMBAR Protrusion Shall Be 0.08 mm Total In Excess Of The "b" Dimension At Maximum Material Condition DAMBAR Cannot Be Located On The Lower Radius Of Foot. Minimum Space Between Protrusion And Adjacent Lead Is 0.07 mm.
  - Dimension "D" And "E1" To Be Determined At Datum Plane.

FITIPOWER DCG  
CONTROL COPY



Outline Information (Continued)

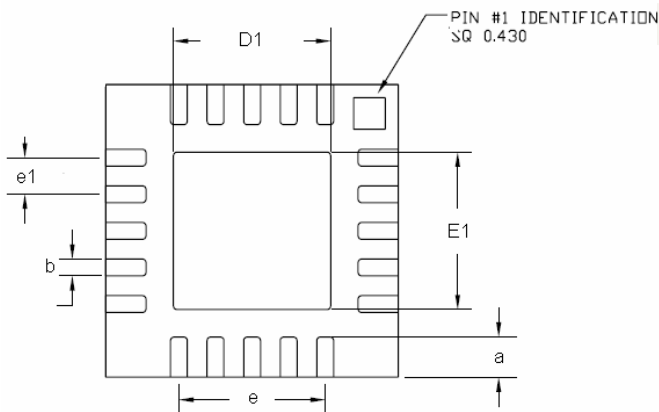
TQFN-20, 4mm x 4mm Package (Unit: mm)



TOP VIEW

SYMBOLS UNIT	DIMENSION IN MILLIMETER		
	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	---	0.050	---
A2	---	0.203(Ref)	---
E	3.95	4.0	4.05
D	3.95	4.0	4.05
a	0.5	0.55	0.6
b	0.18	0.23	0.28
e	---	2 (Ref)	---
e1	---	0.5(Ref)	---
D1	2.1	2.15	2.2
E1	2.1	2.15	2.2

Note 1 : "A" Share The Same Expose Outline But With Different Thickness.



BOTTOM VIEW



SIDE VIEW

FITIPOWER DCC CONTROL COPY

**Life Support Policy**

Fitipower's products are not authorized for use as critical components in life support devices or other medical systems