ft3364

4-Channel Low Dropout Constant Current LED Driver

GENERAL DESCRIPTION

The ft3364 is a high efficiency low dropout constant current white LED driver designed to drive up to 4 LEDs at 20mA individually. Without switching losses incurred in traditional charge-pump or inductive boost converters, the ft3364 offers the highest possible power efficiency based upon its unique LDO topology. The ft3364 features a low dropout voltage of 80mV at 20mA and allows the LED current to be regulated directly from the power supply. Furthermore, the resistor setting the LED current is integrated on chip, eliminating the need for an external resistor.

The ft3364 features a single-wire interface to enable, disable, and set the LED current in 16 linear steps. It requires only one 1uF supply bypass capacitor for a normal operation and is therefore ideal for use in mobile phones or other portable devices, where the PCB space is very limited. The ft3364 has an internal deglitch circuit for filtering the noise on EN input.

The ft3364 is available in DFN2x2-8L and MSOP-8L packages.

FEATURES

- Drives up to 4 LEDs
- ±1% LED current matching (typical)
- Maximum LED sink current 20mA
- Low dropout: 80mV (typical) at 20mA
- Deglitch circuit at EN pin
- Soft-start function
- Shutdown current 0.1μA (typical)
- ESD protection: 4000V (HBM)
- Single-wire interface for enable, disable, or 16-step brightness control
- Available in DFN2x2-8L and MSOP-8L packages

APPLICATIONS

- Cell phone, PDA and other handheld devices
- LCD display backlight and keyboard backlight
- Digital camera

APPLICATION CIRCUIT

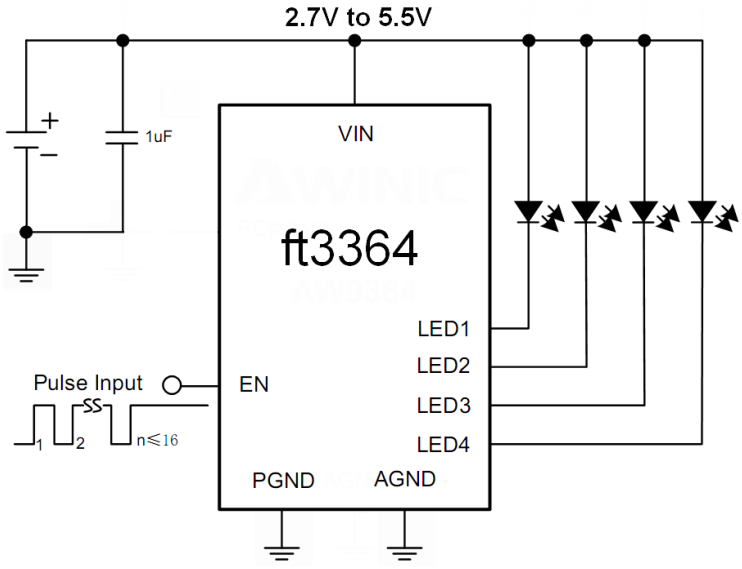
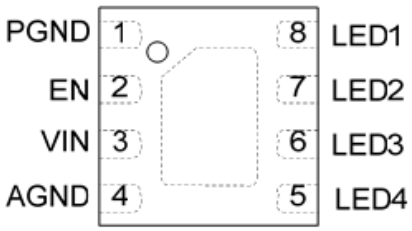


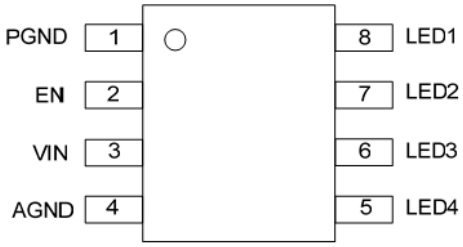
Figure 1: Typical LED Application Circuit

PIN CONFIGURATION AND DESCRIPTION

ft3364 DFN2X2-8L Package



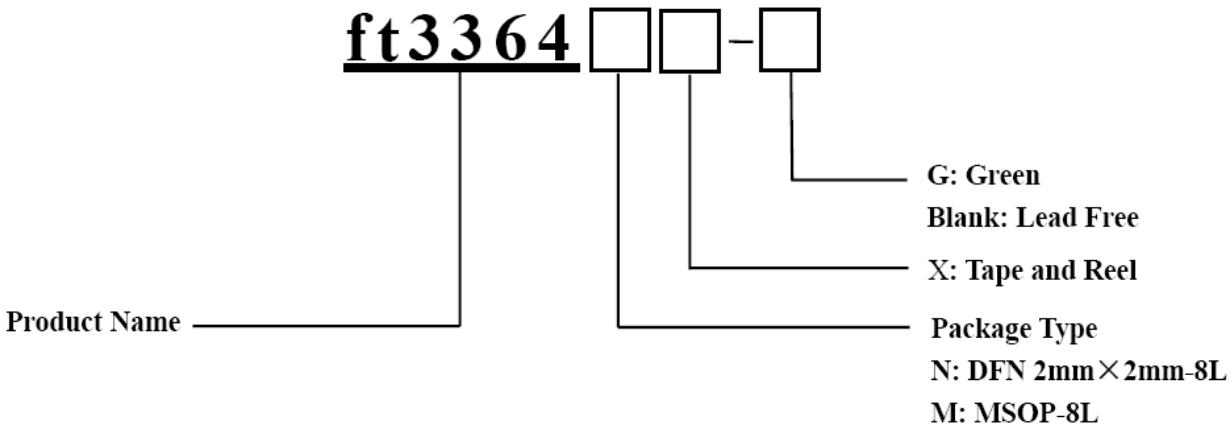
ft3364 MSOP-8L Package



DFN2X2-8L	MSOP-8L	SYMBOL	DESCRIPTION
1	1	PGND	Power ground
2	2	EN	Active high enable control, typically tied to GPIO pin of MCU
3	3	VIN	Supply voltage
4	4	AGND	Analog ground
5	5	LED4	Current sink for LED4
6	6	LED3	Current sink for LED3
7	7	LED2	Current sink for LED2
8	8	LED1	Current sink for LED1

ORDERING INFORMATION

P/N		TEMPERATURE RANGE	PACKAGE	PACK QTY
LEAD FREE	GREEN			
ft3364NX	ft3364NX-G	-40°C to +85°C	DFN 2X2-8L	5,000 units / Reel
ft3364MX	ft3364MX-G	-40°C to +85°C	MSOP-8L	3,000 units / Reel



ABSOLUTE MAXIMUM RATINGS

PARAMETER	VALUE
VIN, EN, LEDx	-0.3V to 6.0 V
Storage temperature	−65°C to +150°C
ESD Ratings - Human Body Model (HBM)	4000V
Junction temperature	150°C
Maximum soldering temperature (at leads10 sec)	260°C

Note: Stresses beyond those listed under absolute maximun ratings may cause permanent damage to the device. These are stress ratings only,and functional operation of the device at these or any other conditions beyond those indicated under recommended operating conditions is not implied.Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

PACKAGE DISSIPATION RATINGS

PACKAGE	Θ_{JC}	Θ_{JA}	UNIT
DFN2X2-8L		78	°C/W
MSOP-8L		190	°C/W

RECOMMENDED OPERATING CONDITIONS

PARAMETER	MIN	TYP	MAX	UNIT
Supply voltage (VIN)	2.7		5.5	V
Operating free-air temperature, TA	-40		85	°C
LED forward voltage (VF)	1.5		VIN-0.15	V

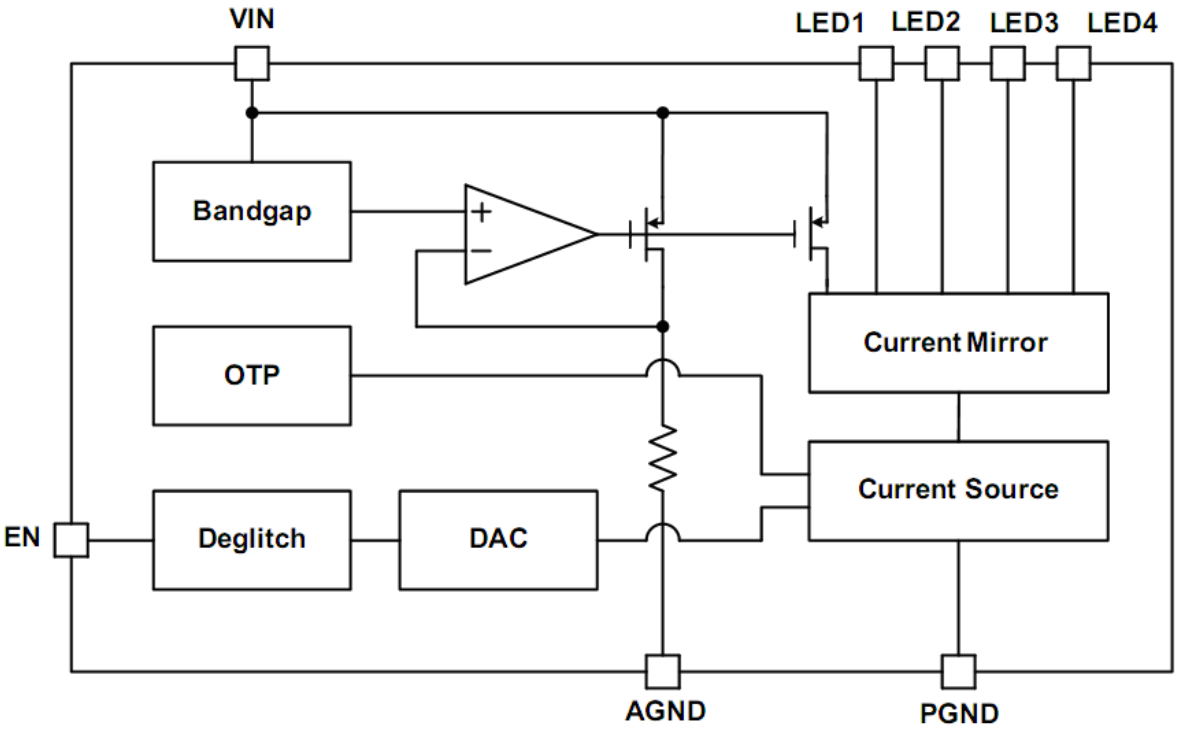
ELECTRICAL CHARACTERISTICS

Over recommended operating conditions, VIN = 3.6 V, C_{IN}=1uF, EN = High, TA = 25°C, unless otherwise noted.

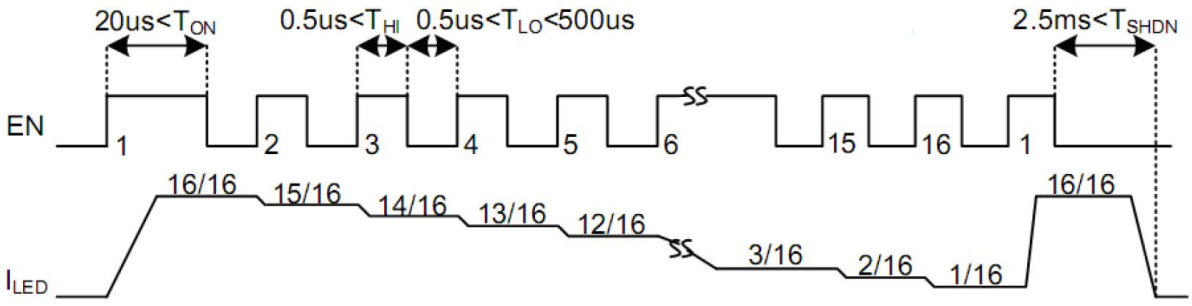
SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
VIN	Supply voltage		2.7		5.5	V
IQ	Quiescent current	ILEDx=0		700		μA
ILEDx	LED sink current	100% Dimming, ILED1 ~ ILED4	18.5		21.5	mA
ΔILED	Led channel match	100% Dimming, ILED1 ~ ILED4	-3		+3	%
VDO	LED dropout (Note 1)	ILED=20mA		80		mV
ISD	Shutdown current	EN = 0V		0.1	1.0	μA
VIH	EN HIGH input voltage		1.5			V
VIL	EN LOW input voltage				0.4	V
TON	Startup time			20		μs
TLO	Duration of EN LOW		0.5		500	μs
THI	Duration of EN HIGH		0.5			μs
TSHDN	Duration of shutdown	EN = 0V	2.5			ms
TP	Thermal shutdown			145		°C
THYS	Thermal hysteresis			20		°C

Note 1: The LED dropout is defined as the lowest voltage at LEDx when the LED sink current falls to 90% of its original value.

FUNCTION BLOCK DIAGRAM



TIMING



LED CURRENT SETTINGS

NUMBER OF EN PULSES	LED CURRENT (MA)	NUMBER OF EN PULSES	LED CURRENT (MA)
1	20	9	10
2	18.75	10	8.75
3	17.5	11	7.5
4	16.25	12	6.25
5	15	13	5
6	13.75	14	3.75
7	12.5	15	2.5
8	11.25	16	1.25

TYPICAL PERFORMANCE CHARACTERISTICS

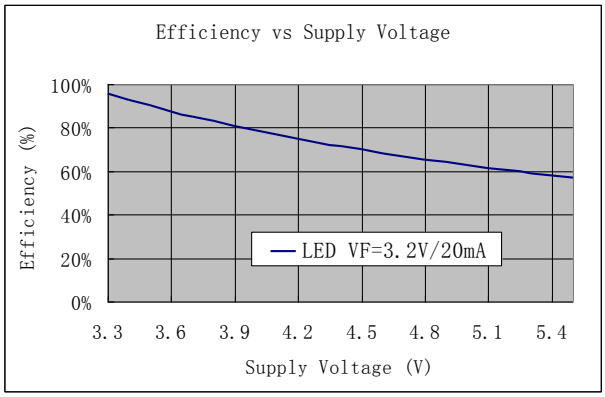


Figure 4: Efficiency vs. Supply Voltage

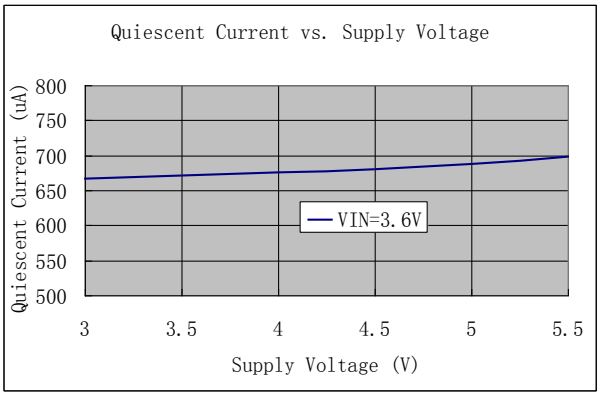


Figure 5: Quiescent Current vs. Supply Voltage

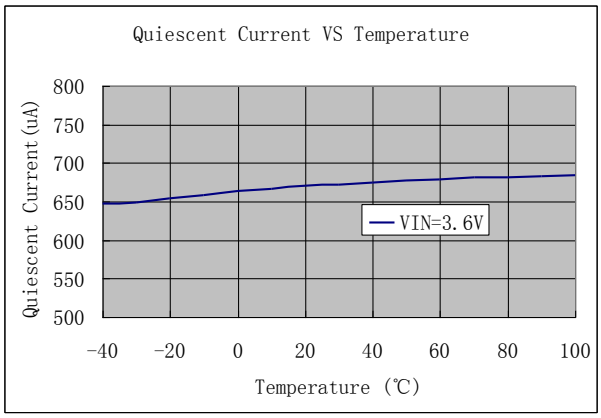


Figure 6: Quiescent Current vs. Temperature

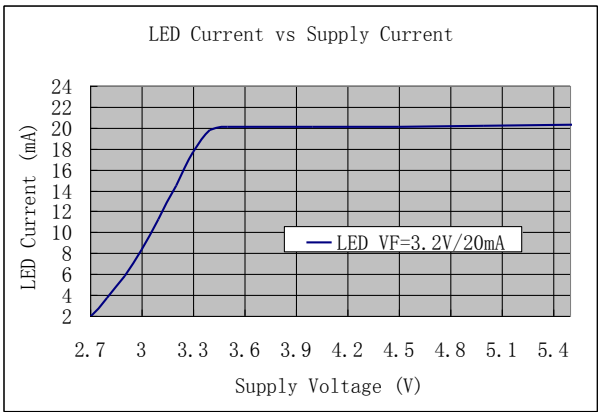


Figure 7: LED Current vs. Supply Current

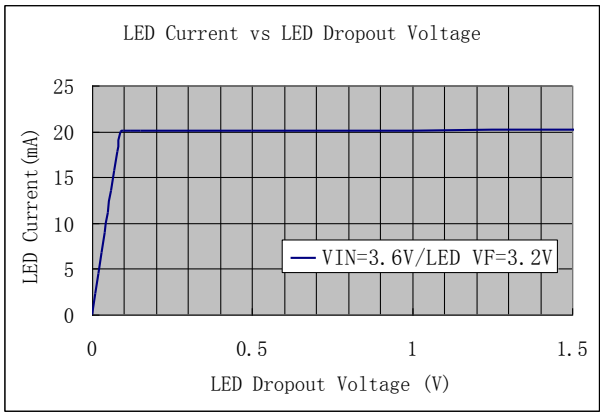


Figure 8: LED Current vs. LED Dropout Voltage

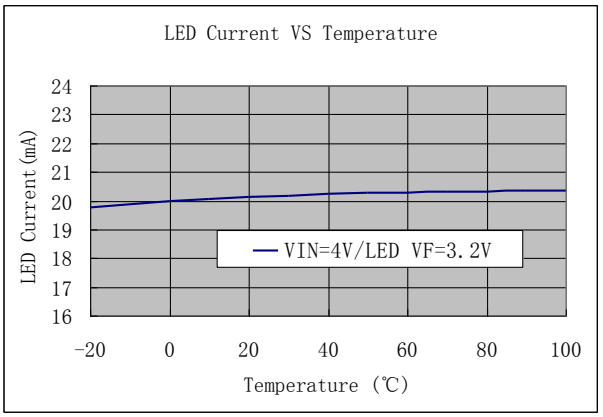


Figure 9: LED Current vs. Temperature

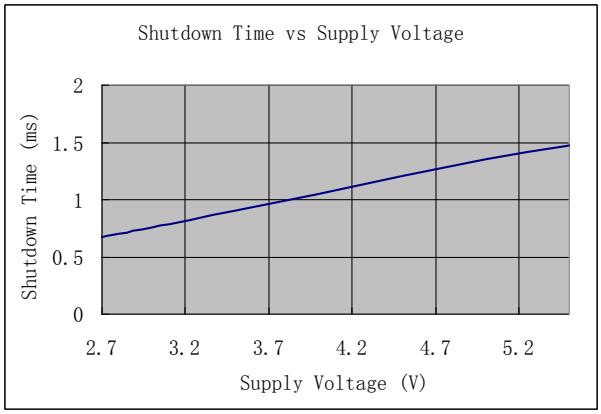


Figure 10: shutdown Time vs. Supply Voltage

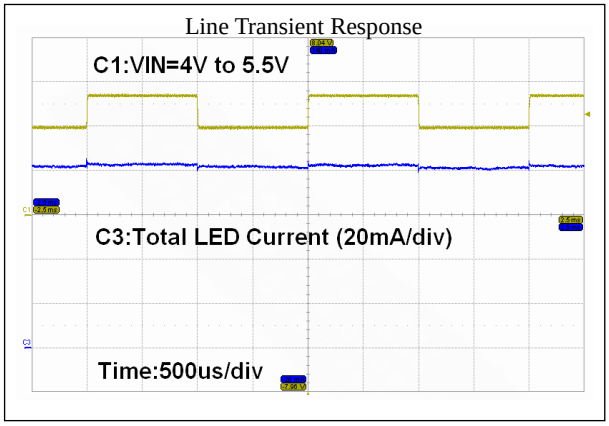


Figure 11: Line Transient Response

APPLICATION INFORMATION

The ft3364 employs an internal resistor to set the LED currents. It requires only a supply bypass capacitor for a normal operation. The ft3364 can drive up to 20mA constant LED current with a low dropout voltage (80mV typical). The ft3364 incorporates a single-wire interface to program the LED currents at 16 linear steps.

UVLO

The operating supply voltage of the ft3364 ranges from 2.7V to 5.5V. A supply bypass capacitor is typically required at the VIN pin to reduce the voltage ripples. A ceramic capacitor of no less than 1μF is recommended for a stable operation. The ft3364 features an under-voltage-lockout (UVLO) to prevent it from an unreliable or abnormal start-up when the supply voltage is first applied. The low-to-high threshold of UVLO is set at 2.0V typically.

SOFT-START

The ft3364 employs a soft-start feature to limit the inrush current during startup. The soft-start clamps the input current over a typical period of 20μs.

LED CONNECTION

The ft3364 supports up to 4 white LEDs. The four LEDs are connected from VIN to pin LED1, LED2, LED3 and LED4 respectively. If the LED is not used, the LED pin should be left open or shorted to VIN.

BRIGHTNESS CONTROL

The ft3364 implements a pulse dimming scheme to control the brightness of white LEDs. Users can configure the LED current from 1.25mA to 20mA by a string of pulses applied to the EN pin. There are a total of 16 linear steps of currents that can be selected. The operation principle of brightness dimming is depicted in Figure 3.

At power-up, the first low-to-high transition sets the LED current to its full-scale level (20mA), as shown in Figure 3. On each rising edge of the subsequent pulses, the LED current is scaled consecutively by a factor of 15/16, 14/16, 13/16, 12/16 ….and 1/16. Any pulses whose duration is less than the minimum, T_{LO}, will be ignored and filtered out by the device. A pulse whose duration is more than the maximum, T_{LO}, will result in the device in the shutdown mode.

SHUTDOWN CONTROL

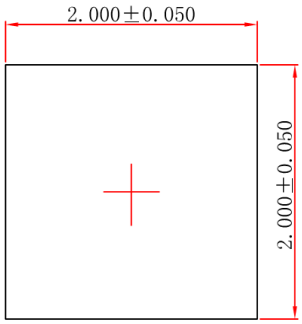
When EN pin is held low for more than 2.5ms, the ft3364 will enter into the shutdown mode.

PROECTION

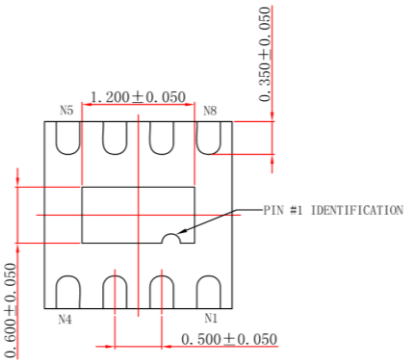
If the die temperature exceeds +145°C, the driver will enter a thermal shutdown mode. When the device temperature drops below 125°C, the device will resume a normal operation.

PHYSICAL DIMENSIONS

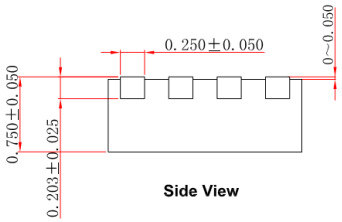
ft3364 DFN2mmX2mm-8LOutline Package



Top View

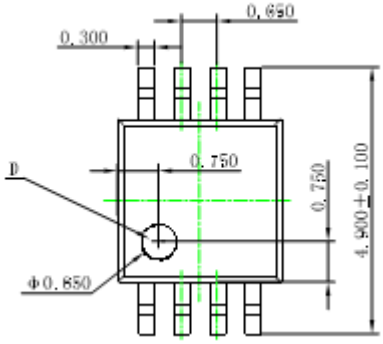


Bottom View

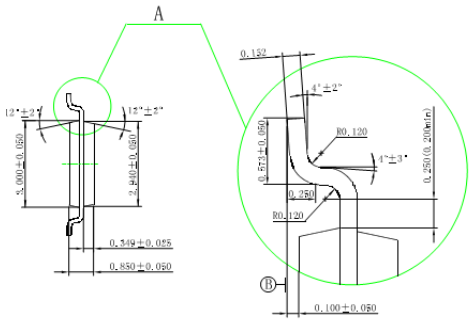


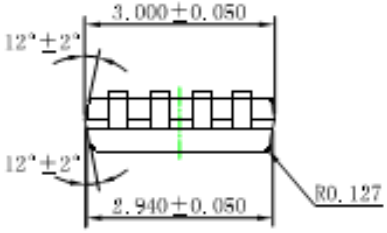
Side View

ft3364 MSOP-8L Outline Package



Top View





Side View

NOTES*: All dimensions are in millimeters.

IMPORTANT NOTICE

1. Disclaimer: The information in document is intended to help you evaluate this product. Fangtek, LTD. makes no warranty, either expressed or implied, as to the product information herein listed, and reserves the right to change or discontinue work on this product without notice.

2. Life support policy: Fangtek's products are not authorized for use as critical components in life support devices or systems without the express written approval of the president and general counsel of Fangtek Inc. As used herein

Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.

A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

3. Fangtek assumes no liability for incidental, consequential or special damages or injury that may result from misapplications or improper use or operation of its products

4. Fangtek makes no warranty or representation that its products are subject to intellectual property license from Fangtek or any third party, and Fangtek makes no warranty or representation of non-infringement with respect to its products. Fangtek specifically excludes any liability to the customer or any third party arising from or related to the products' infringement of any third party's intellectual property rights, including patents, copyright, trademark or trade secret rights of any third party.

5. The information in this document is merely to indicate the characteristics and performance of Fangtek products. Fangtek assumes no responsibility for any intellectual property claims or other problems that may result from applications based on the document presented herein. Fangtek makes no warranty with respect to its products, express or implied, including, but not limited to the warranties of merchantability, fitness for a particular use and title.

6. Trademarks: The company and product names in this document may be the trademarks or registered trademarks of their respective manufacturers. Fangtek is trademark of Fangtek, LTD.

CONTACT INFORMATION

Fangtek Electronics (Shanghai) Co., Ltd

Room 503&504, Lane 198, Zhangheng Road
Zhangjiang Hi-tech Park, Pudong District
Shanghai, China, 201204

Tel: +86-21-61631978
Fax: +86-21-61631981
Website: www.fangtek.com.cn