

Description

The AL3157 is a low noise, constant frequency charge pump DC/DC converter that uses a Dual mode load switch (1x), and doubling (2x) conversion for driving white LEDs. Low external part count (one 1 μ F flying capacitor and two 2.2 μ F capacitors at V_{IN} and V_{OUT}) make this part ideally suited for small, battery-powered applications.

The AL3157 drives 3 channels at up to 30mA for small screen backlighting and an additional channel up to 210mA for LED Flash or LED Flashlight – All from a 2.7V to 5.5V input.

The AL3157 uses two control inputs (EN1/2) to enable/disable it and PWM dim the LED current. EN2 controls/PWM dims the backlight LEDs at 30mA per channel and EN1 controls/PWM dims the Flash/Flashlight LEDs at 210mA.

Each output is equipped with built-in protection for V_{OUT} short circuit and auto-disable for LED failure conditions. Built-in soft-start circuitry prevents excessive in-rush current during start-up and mode switching. A low-current shutdown feature disconnects the load from V_{IN} to reduce quiescent current less than 1 μ A.

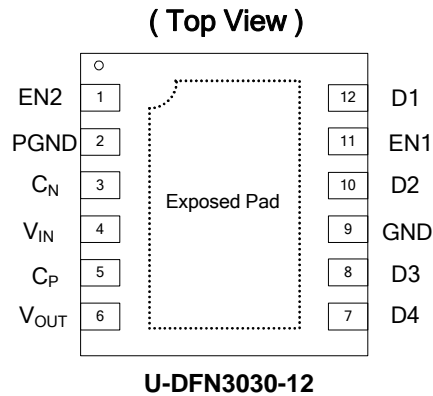
The AL3157 is available in a lead-free, space-saving thermally enhanced 12-pin 3x3mm DFN package.

Features

- Dual-Mode 1x and 2x Charge Pump
- Up to 300mA drive capability
 - 3-channel for backlight – 30mA/ch
 - 1-channel for Flash/light – 210mA
- V_{IN} Range: 2.7V to 5.5V
- Two simple PWM dimming control inputs up to 50kHz
- 1.2 MHz Constant Switching Frequency
- Built-In Thermal, Open-Circuit and V_{OUT} short circuit Protection
- Soft Start for reducing in-rush current
- $I_Q < 1\mu A$ in Shutdown
- Thermally-Enhanced DFN3030-12 Package:
Available in "Green" Molding Compound (No Br, Sb)
- Lead Free Finish/ RoHS Compliant (Note 1)

Notes: 1. EU Directive 2002/95/EC (RoHS). All applicable RoHS exemptions applied. Please visit our website at http://www.diodes.com/products/lead_free.html

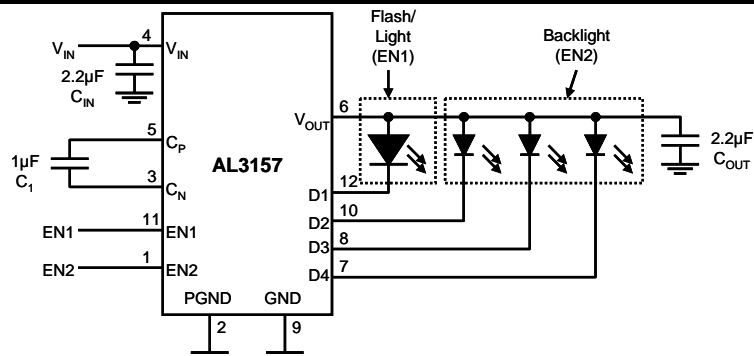
Pin Assignments



Applications

- Smart Touch Phone LED Backlighting
- PDA White LED backlighting
- Backlighting + Torch light

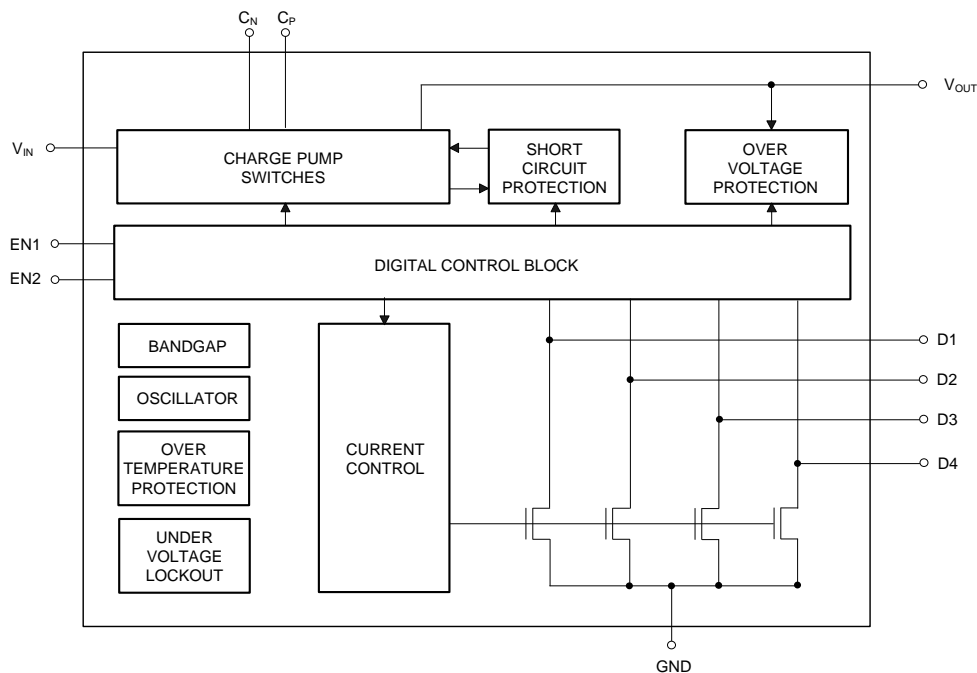
Typical Application Circuit



Pin Descriptions

Pin Name	Pin Number	Description
EN2	1	Enable Pin 2: Controls outputs D2, D3 and D4
PGND	2	Charge Pump Switch Ground: Connect to GND
C _N	3	Negative Terminal of Flying Capacitor
V _{IN}	4	Input Power Supply. Decouple with a 2.2μF capacitor between this pin and ground.
C _P	5	Positive Terminal of Flying Capacitor
V _{OUT}	6	Charge pump output to drive D1~D4 load circuit. Decouple with a 2.2μF capacitor between this pin and ground.
D4	7	Current sink input #4. Drive up to 30mA LED current. Connect to V _{OUT} when un-used.
D3	8	Current sink input #3. Drive up to 30mA LED current. Connect to V _{OUT} when un-used.
GND	9	Ground
D2	10	Current sink input #2. Drive up to 30mA LED current. Connect to V _{OUT} when un-used.
EN1	11	Enable Pin 1: Controls output D1
D1	12	Current sink input #1. Drive up to 210mA LED current. Connect to V _{OUT} when un-used.
EP	EP PAD	Exposed Pad (bottom). Connect to GND directly underneath the package.

Functional Block Diagram



Absolute Maximum Ratings (Note 2)

Symbol	Description	Rating	Unit
ESD HBM	Human Body Model ESD Protection	2	kV
ESD MM	Machine Model ESD Protection	200	V
V _{IN}	Input Voltage	-0.3 to 6	V
V _{EN1,2,3}	EN1, EN2, EN3 to GND Voltage	-0.3 to V _{IN} +0.3	V
I _{OUT}	Maximum DC Output Current	300	mA
T _J	Operating Junction Temperature Range	125	°C
T _{LEAD}	Maximum Soldering Temperature (at leads, 10 sec)	300	°C

Notes: 2. Exceeding Absolute Maximum Ratings will cause permanent damage to the device.

Recommended Operating Conditions

Symbol	Parameter	Min	Max	Unit
V _{IN}	Input Voltage	2.7	5.5	V
V _{ENL(1,2)}	EN1,2 Threshold Low	0	0.4	V
V _{ENH(1,2)}	EN1,2, Threshold High	1.4	V _{IN}	V
T _A	Operating Ambient Temperature	-40	85	°C

Electrical Characteristics

 V_{IN} = 4V, C_{IN} = C_{OUT} = 2.2μF, C₁ = 1μF; T_A = 25°C unless otherwise noted.

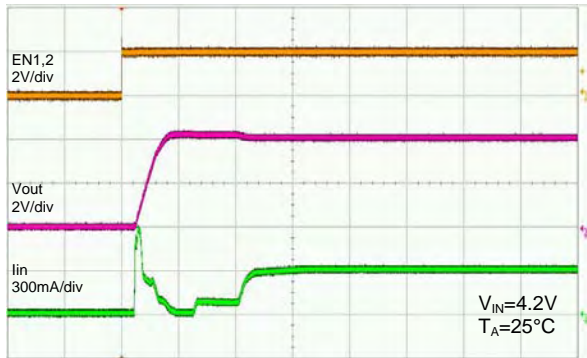
Symbol	Parameter	Test Conditions	Min	Typ.	Max	Unit
I _Q	Quiescent Current	1x Mode, 3.0 ≤ V _{IN} ≤ 5.5, Active, No Load Current		0.3	0.6	mA
		2x Mode, 3.0 ≤ V _{IN} ≤ 5.5, Active, No Load Current		2	5	
I _{SHDN}	Shutdown Current	EN1, EN2 = 0			1	μA
I _{D2-4}	Backlight LED Drive Sink Current Accuracy (Note 3)	I _{DX} = 30mA	28.5	30	31.5	mA
I _{D1}	Flash/light LED Drive Sink Current Accuracy (Note 3)	I _{D1} = 210mA	199.5	210	220.5	mA
I _{D-Match}	Current Matching Between Any Two Backlight LED Drive Current Sink Outputs (Note 4)	V _F : D2:D4 = 4V		1	2	%
R _{out}	Charge Pump V _{OUT} Open Loop Resistance	1x mode		0.5		Ω
		2x mode		4.5		
V _{TH-Dx}	1x to 2x Transition Threshold at D2, D3 and D4 Pins	I _D = 30mA		150		mV
V _{TH-D1}	1x to 2x Transition Threshold at D1 Pin	I _{D1} = 210mA		150		mV
V _{HS}	Mode Transition Threshold				500	mV
t _{SS}	Soft-Start Time			100		μs
f _{SW}	Switching Frequency			1.2		MHz
t _{EN1,2}	EN1,2 Off Timeout				20	ms
UVLO	V _{IN} Under-Voltage Lockout		1.8	2	2.2	V
I _{EN1,2}	EN1, 2 Input Leakage		-1		1	μA
T _{SHDN}	Thermal Shutdown Protection			160		°C
T _{HYS}	Thermal Shutdown Hysteresis			10		°C
θ _{JA}	Thermal Resistance Junction-to-Ambient	U-DFN3030-12 (Note 5)		55.29		°C/W

 Notes: 3. Determined by the mean of channels 2,3 and 4 currents, EG (I_{D2} + I_{D3} + I_{D4})/3
 4. Determined by the maximum sink current (MAX), the minimum sink current (MIN), and the average sink current (AVG). Two matching numbers are calculated as (MAX-AVG)/AVG and (AVG-MIN)/AVG. The largest number of the two (worst case) is as the matching data.
 5. Device mounted on FR-4 substrate, 2"×2", 2oz, copper, double-sided PC board.

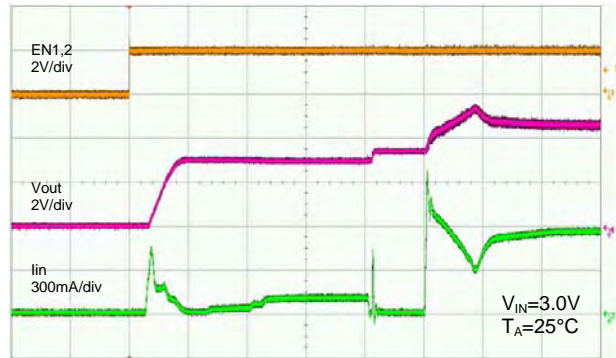
Typical Performance Characteristics

NEW PRODUCT

Turn-On in 1x Mode



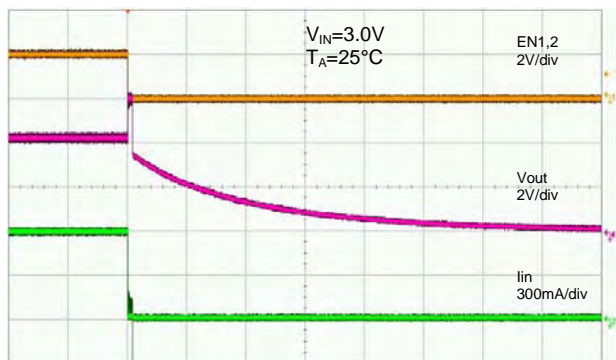
Turn-On in 2x Mode



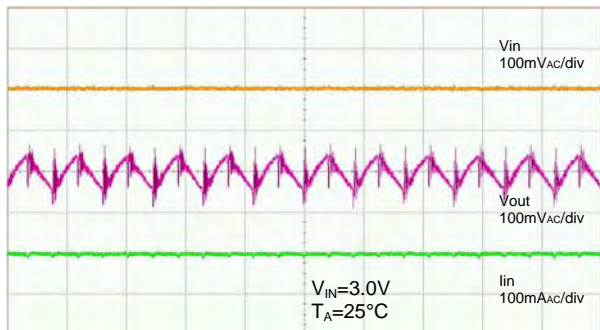
Turn-Off in 1x Mode



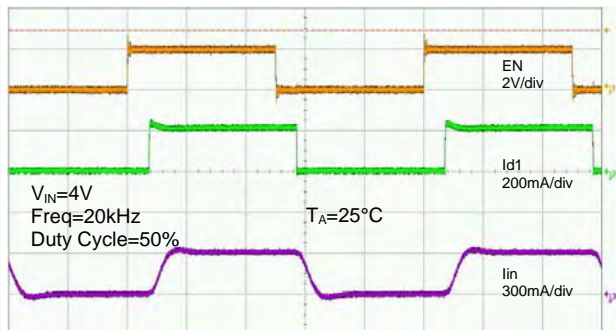
Turn-Off in 2x Mode



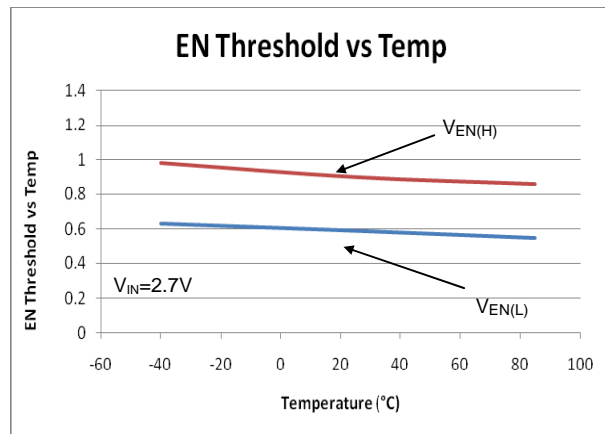
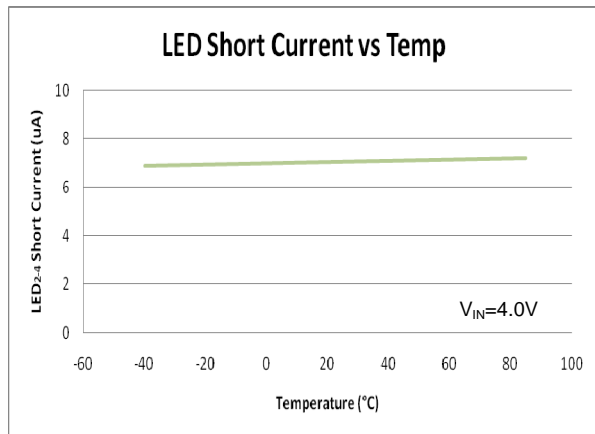
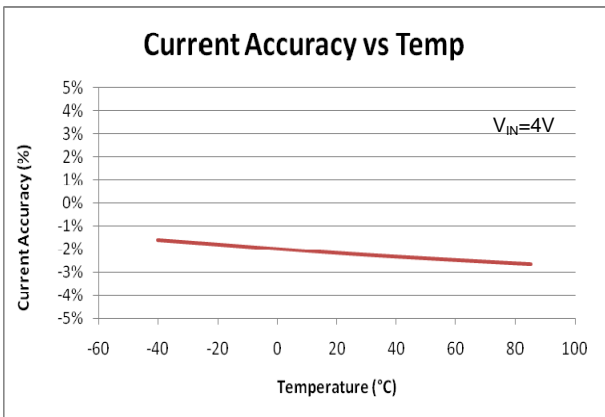
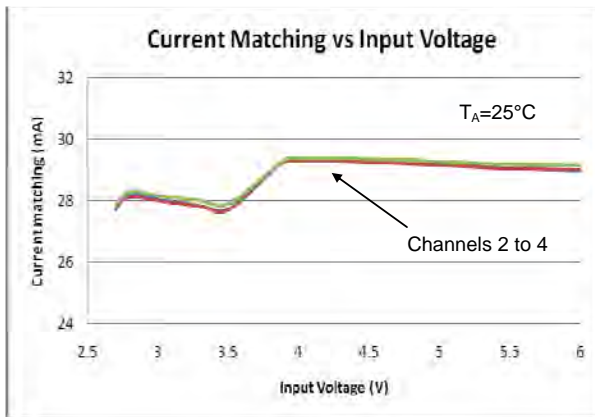
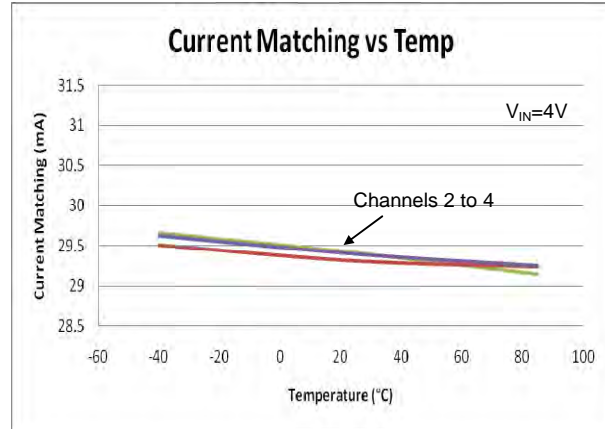
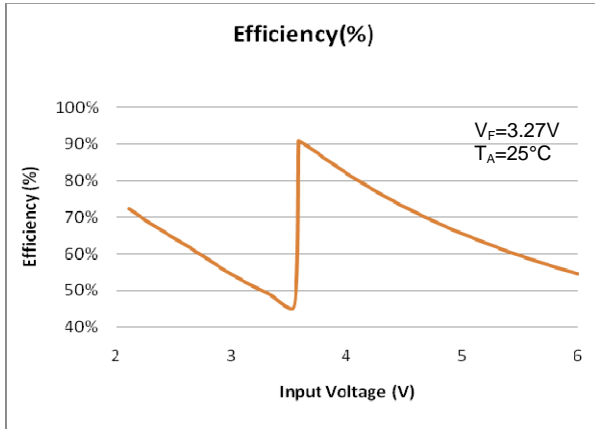
Load Characteristics in 2x Mode



PWM Dimming Control (Duty Cycle=50%)



Typical Performance Characteristics (Continued)



Functional Description

The AL3157 is a dual-mode high efficiency charge pump (1x and 2x) device, driving 3-channel standard backlight LEDs and one high-current Flash/Torch LED, intended for white LED backlight applications. An internal comparator circuit compares the voltage at each constant current sink input against a reference voltage. To ensure maximum power efficiency, the most appropriate switching mode (1x and 2x) is automatically selected.

The APL3157 requires only three external components: one 1 μ F ceramic flying capacitor (C_1) for the charge pump, one 2.2 μ F ceramic input capacitor (C_{IN}), and one 2.2 μ F ceramic charge pump output capacitor (C_{OUT}).

The each output channel of the AL3157 can drive three individual LEDs with a maximum current of 30mA per channel and a Flash/Torch LED with a maximum current of 210mA. These can be paralleled to give a total output current of 300mA.

LED Control Table

EN1	EN2	D1	D2, D3, D4
0	0	OFF	OFF
0	1	OFF	ON
1	0	ON	OFF
1	1	ON	ON

Disabled Current Sinks

Unused current channels must be disabled by connecting the sinks to VOUT with only a small sense current flowing through the disabled channel.

Soft-Start

Soft-start is incorporated to prevent excessive in-rush current during power-up, mode switching, and transitioning out of stand-by mode.

Short-Circuit Protection

Short-circuit protection function is incorporated to prevent excessive load current when either flying cap terminals or output pin electrically tied to a very lower voltage or ground.

Over-Voltage Protection

Over-Voltage Protection function is incorporated to limit the output voltage under a safe value to avoid on-chip device breakdown.

Under-Voltage Lockout

Under-Voltage lockout feature disables the device when the input voltage drops below UVLO threshold.

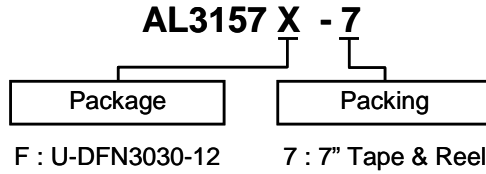
Thermal Auto Shutdown

When the die temperature exceeds the thermal limit, the device will be disabled and enter stand-by mode. The operation resumes whenever the die cools off sufficiently.

PWM Dimming Control

The AL3157 provides simple PWM dimming control through ENx pins, and the current is adjusted by the duty cycle of the signal applied on ENx pin. The recommended PWM frequency is from 200Hz to 50kHz depending on applications.

Ordering Information



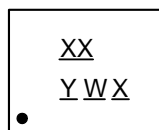
Device	Package Code	Packaging (Note 7)	7" Tape and Reel	
			Quantity	Part Number Suffix
AL3157F-7	F	U-DFN3030-12	3000/Tape & Reel	-7

Notes: 7. Pad layout as shown on Diodes Inc. suggested pad layout document AP02001, which can be found on our website at <http://www.diodes.com/datasheets/ap02001.pdf>

Marking Information

(1) U-DFN3030-12

(Top View)

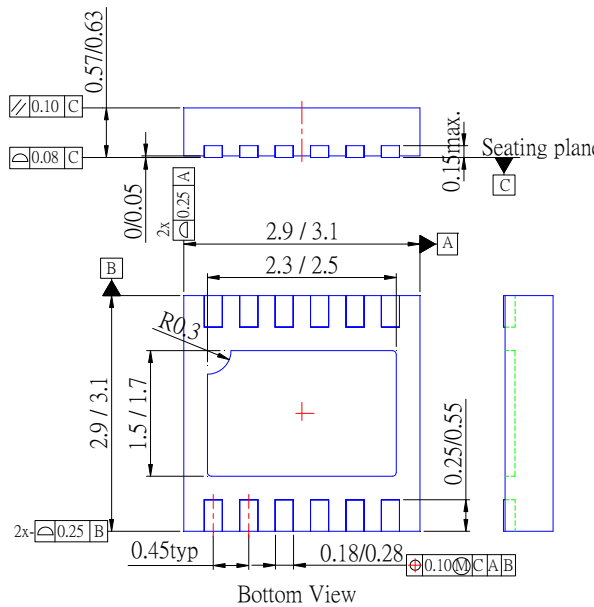


XX : B7 : AL3157
 Y : Year : 0~9
 W : Week : A~Z : 1~26 week;
 a~z : 27~52 week;
 z : represents 52 and 53
 X : A~Z : Green

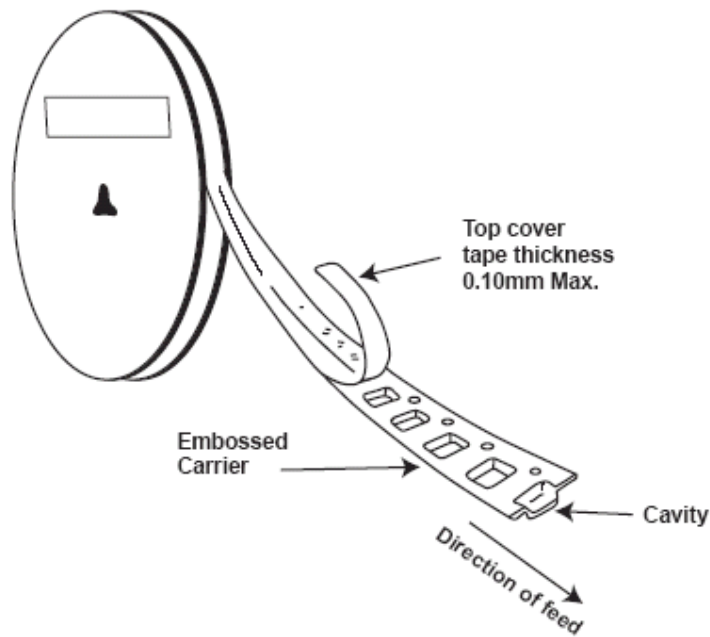
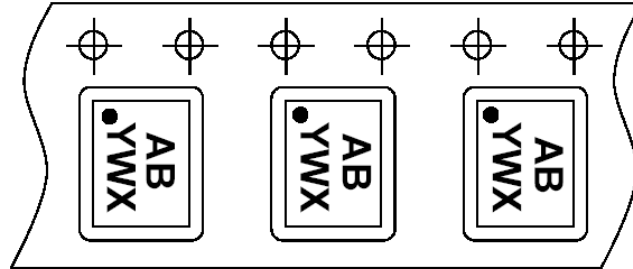
Part Number	Package	Identification Code
AL3157F	U-DFN3030-12	B7

Package Information

(1) Package type: U-DFN3030-12



Tape Orientation (Note 8)



Notes: 8. The taping orientation of the other package type can be found on our website at <http://www.diodes.com/datasheets/ap02007.pdf>

NEW PRODUCT

IMPORTANT NOTICE

DIODES INCORPORATED MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARDS TO THIS DOCUMENT, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION).

Diodes Incorporated and its subsidiaries reserve the right to make modifications, enhancements, improvements, corrections or other changes without further notice to this document and any product described herein. Diodes Incorporated does not assume any liability arising out of the application or use of this document or any product described herein; neither does Diodes Incorporated convey any license under its patent or trademark rights, nor the rights of others. Any Customer or user of this document or products described herein in such applications shall assume all risks of such use and will agree to hold Diodes Incorporated and all the companies whose products are represented on Diodes Incorporated website, harmless against all damages.

Diodes Incorporated does not warrant or accept any liability whatsoever in respect of any products purchased through unauthorized sales channel.

Should Customers purchase or use Diodes Incorporated products for any unintended or unauthorized application, Customers shall indemnify and hold Diodes Incorporated and its representatives harmless against all claims, damages, expenses, and attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized application.

Products described herein may be covered by one or more United States, international or foreign patents pending. Product names and markings noted herein may also be covered by one or more United States, international or foreign trademarks.

LIFE SUPPORT

Diodes Incorporated products are specifically not authorized for use as critical components in life support devices or systems without the express written approval of the Chief Executive Officer of Diodes Incorporated. As used herein:

- A. Life support devices or systems are devices or systems which:
1. are intended to implant into the body, or
 2. 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 significant injury to the user.
- B. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or to affect its safety or effectiveness.

Customers represent that they have all necessary expertise in the safety and regulatory ramifications of their life support devices or systems, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of Diodes Incorporated products in such safety-critical, life support devices or systems, notwithstanding any devices- or systems-related information or support that may be provided by Diodes Incorporated. Further, Customers must fully indemnify Diodes Incorporated and its representatives against any damages arising out of the use of Diodes Incorporated products in such safety-critical, life support devices or systems.

Copyright © 2011, Diodes Incorporated

www.diodes.com

Компания «Life Electronics» занимается поставками электронных компонентов импортного и отечественного производства от производителей и со складов крупных дистрибьюторов Европы, Америки и Азии.

С конца 2013 года компания активно расширяет линейку поставок компонентов по направлению коаксиальный кабель, кварцевые генераторы и конденсаторы (керамические, пленочные, электролитические), за счёт заключения дистрибьюторских договоров

Мы предлагаем:

- Конкурентоспособные цены и скидки постоянным клиентам.
- Специальные условия для постоянных клиентов.
- Подбор аналогов.
- Поставку компонентов в любых объемах, удовлетворяющих вашим потребностям.
- Приемлемые сроки поставки, возможна ускоренная поставка.
- Доставку товара в любую точку России и стран СНГ.
- Комплексную поставку.
- Работу по проектам и поставку образцов.
- Формирование склада под заказчика.
- Сертификаты соответствия на поставляемую продукцию (по желанию клиента).
- Тестирование поставляемой продукции.
- Поставку компонентов, требующих военную и космическую приемку.
- Входной контроль качества.
- Наличие сертификата ISO.

В составе нашей компании организован Конструкторский отдел, призванный помогать разработчикам, и инженерам.

Конструкторский отдел помогает осуществить:

- Регистрацию проекта у производителя компонентов.
- Техническую поддержку проекта.
- Защиту от снятия компонента с производства.
- Оценку стоимости проекта по компонентам.
- Изготовление тестовой платы монтаж и пусконаладочные работы.



Тел: +7 (812) 336 43 04 (многоканальный)

Email: org@lifeelectronics.ru