

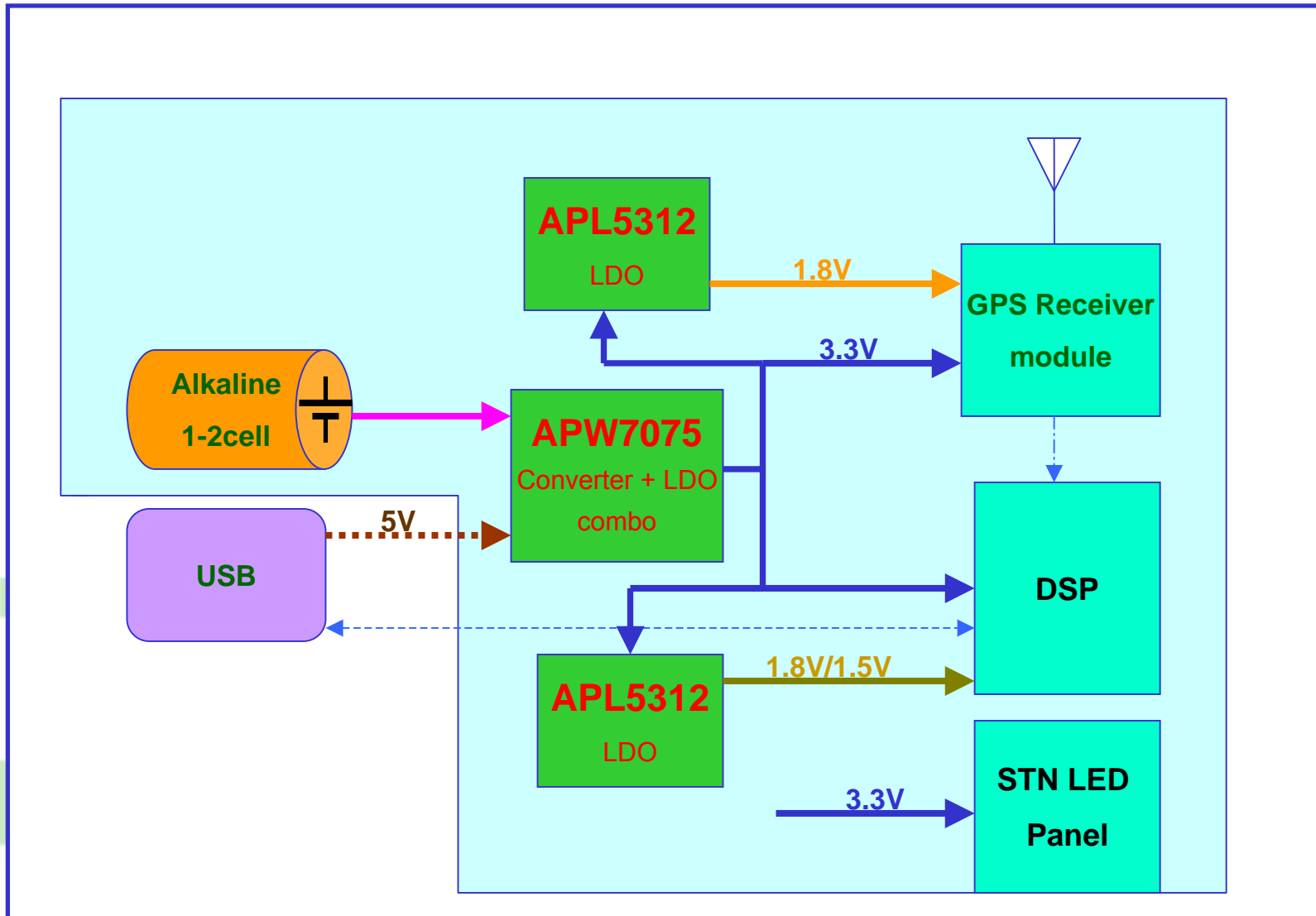
# ***GPS+ Navigation/PDA Power Management Design***

ANPEC TME DEPT.

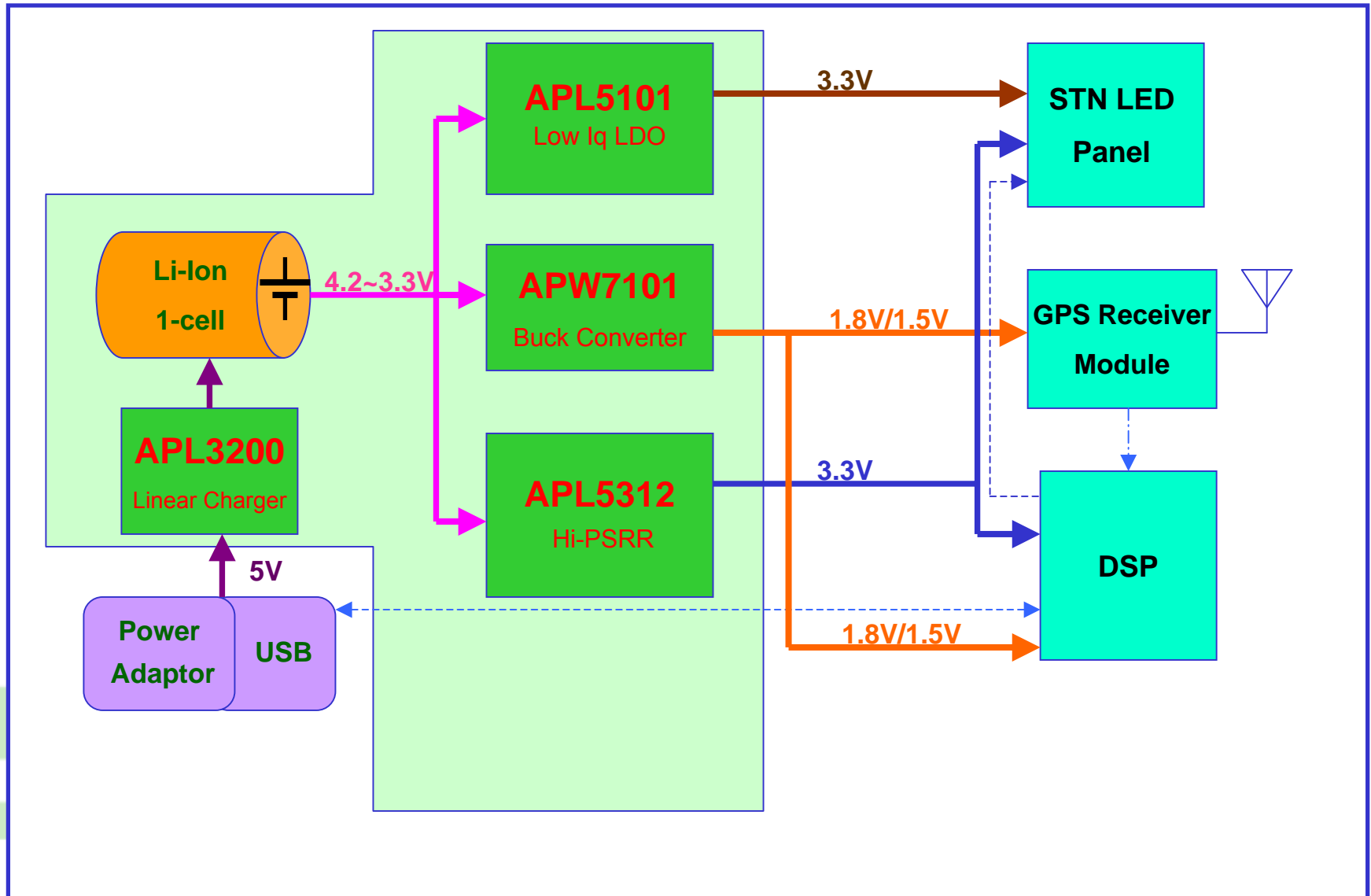
TME

15/08/2006

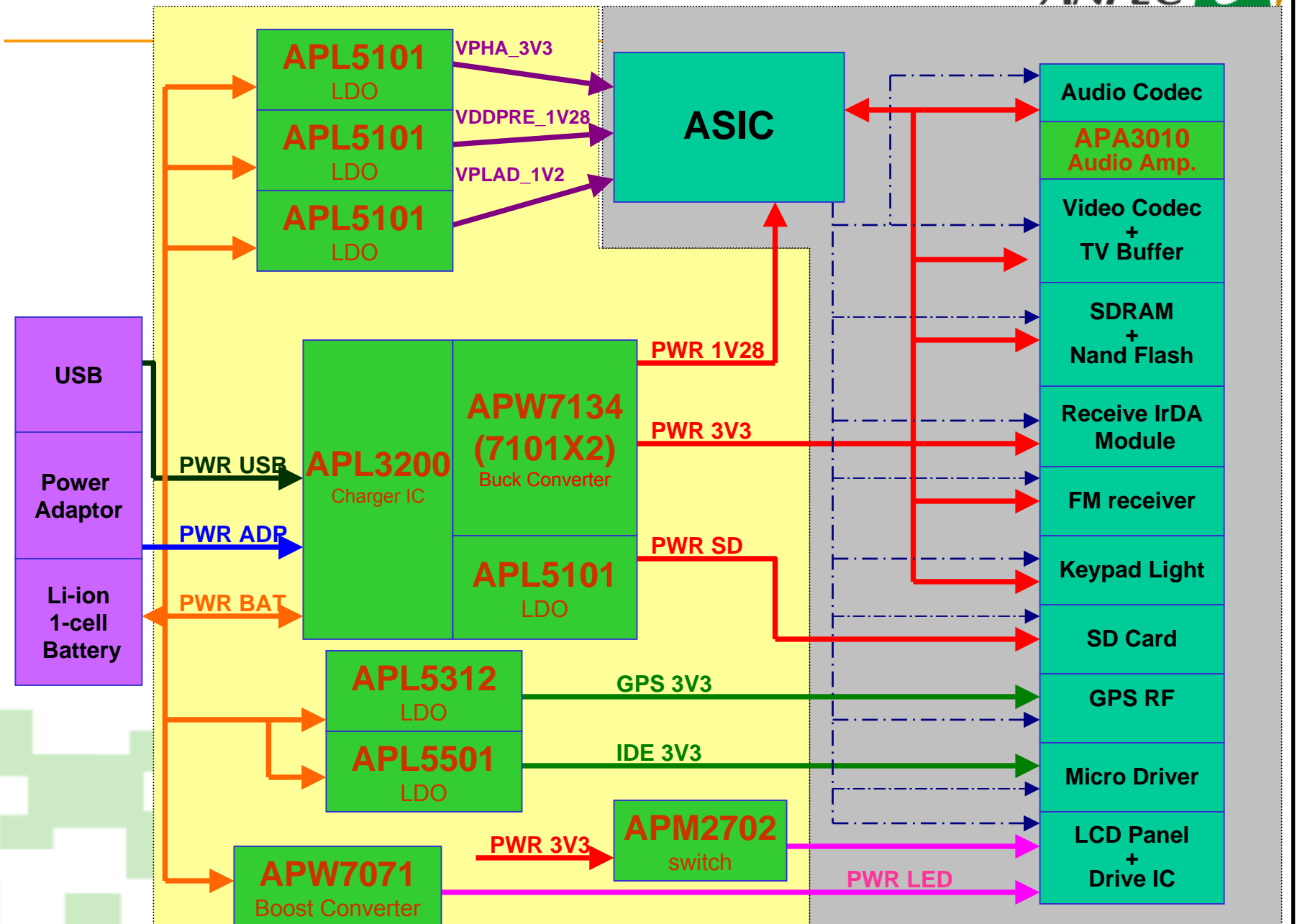
# GPS Handheld System (Alkaline Battery)



# GPS Handheld System (Li-Ion Battery)



# GPS+Navigation/PDA System for ANPEC Solution



# ANPEC Power Solution List”



[www.anpec.com.tw](http://www.anpec.com.tw)

	<b>Spec.</b>	<b>ANPEC Solution</b>	<b>Reference Solution</b>	<b>Remark</b>
<b>PWM/PFM DC/DC</b>	Boost Converter	APW7075		TSSOP8 Embedded MOSFET
		APW7076	<b>MP3</b>	<b>Q3/06</b>
		APW7079	<b>ELA, Consumer</b>	<b>Q3/06, Low IQ</b>
	Boost Controller	APW7077/A	XC6367, NCP1450A	SOT-23-5
		APW7078	AT1380/A, MB3800	MSOP8, TSSOP8
	Buck Converter	APW7101	AT1366, RT8008, MPS2104, LTC3406	SOT-23-5
		APW710X		<b>Q4/06, Low IQ, SOT23-5 Max. 800mA</b>
		APW7103	XC9216, TPS62220	<b>Q3/06, SOT23-5 Max.800mA</b>
	Multi-Function	APW7133	<b>ODD, Consumer</b>	<b>DFN-10, Buck+LDO</b>
		APW7134	<b>TV-Tunnel</b>	<b>DFN-10, Dual Buck</b>
	High Voltage Buck Controller	APW1172/3	L5973D	SOP8-P, 250/500KHZ
		APW7070	<b>P-DVD/ DVB-T</b>	<b>SOP8-P, Sync.</b>
	LED Driver	APW7071	LM2703, TPS61040, RT9271	SOT23-6
OLED Driver	APW7072	TPS61040	SOT23-6 True shutdown	

# ANPEC Power Solution List”

	<b>Spec.</b>	<b>ANPEC Solution</b>	<b>Reference Solution</b>	<b>Remark</b>
<b>LDO</b>	High PSRR	APL5312	RT9193	SOT-23-5, 300mA
	Ultra Low I <sub>q</sub>	APL5101/2	RT9169, XC6206	SOT-23, SOT-23-5, Low Enable
	Low dropout	APL5501	RT9167A	SOT-23-5, 500mA
	Low dropout	APL5151	RT9167, AME8801	SOT-23-5, 150mA
<b>CHARGER</b>	Linear Charger	APL3200	<b>DSC, GPS</b>	<b>Q3/06</b>
		APL3202	<b>BT handset, MP3</b>	<b>Q4/06</b>
<b>AUDIO AMP.</b>	Class A/B	APA0710/1	TPA751	MSPO8-P, SO8, 1W
		APA3010/1		MSPO8-P, SO8-P, 3W
		APA2068		SOP-16-P, 2.6W
	Class D	APA2010D	<b>GPS, P-DVD/DVB</b>	<b>Q4/06, 2W</b>
	Cap Free	APA4411	<b>BT</b>	Q4/06, headphone, 80mW

# ANPEC Power Solution List”



[www.anpec.com.tw](http://www.anpec.com.tw)

	<b>Spec.</b>	<b>ANPEC Solution</b>	<b>Reference Solution</b>	<b>Remark</b>
<b>Load Switch</b>	<b>Dual N+P</b>	APM2702	SI3865	JSOT-6
		APM2703		<b>JSOT-6, Low Rds on Q2/06</b>
<b>MOSFET</b>	<b>N-channel</b>	APM2300A, APM2322, APW2324	SI2302, AO3400, AO3418	SOT-23
		APM1402, 1404		SC-70
	<b>P-channel</b>	APM2301A, APM2313, APM2323	SI2301, AO3401, AO3419	SOT-23
		APM1401, 1404		SC-70

# APW7101 Step-down Converter

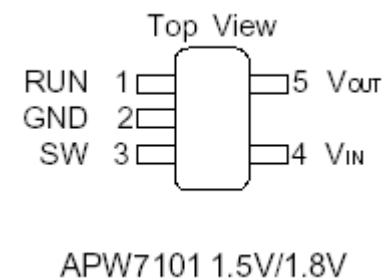
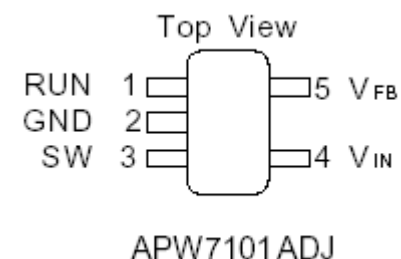


[www.anpec.com.tw](http://www.anpec.com.tw)

## APW7101 Key Feature:

- **600mA** Output Current
- **1.5MHz** Constant Frequency Operation
- Operate **2.5V to 5V** Input voltage
- Low Dropout Operation at **100% Duty cycle**
- **0.6V** Low Reference Voltage
- Synchronous Topology: No Schottky Diode Required
- **Current Mode** Operation for Excellent Line and Load Transient Response
- **Over Temperature and Over Current** Protection
- SOT-23-5 Pin Package
- Lead Free Available (RoHS Compliant)

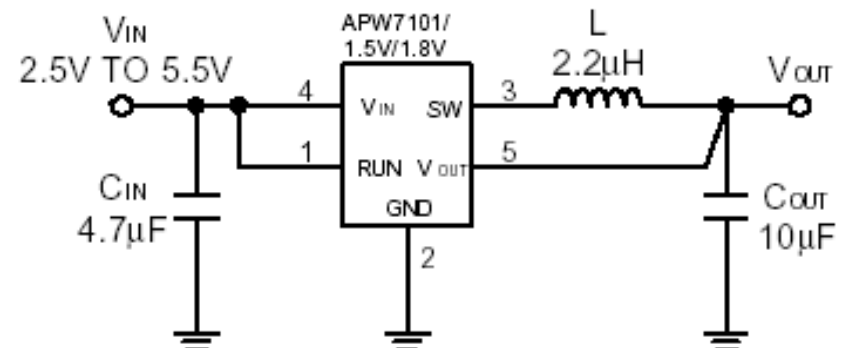
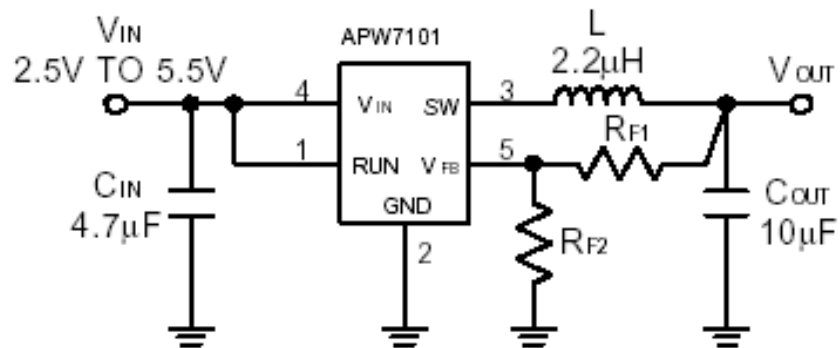
## Pin-out





# APW7101 Application Circuit

## Application Circuit



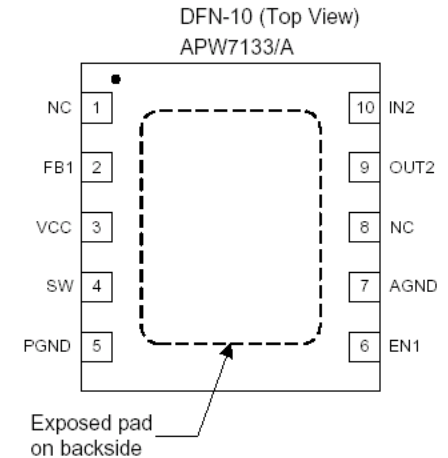
# Comparison Table from Competitor Data

[www.anpec.com.tw](http://www.anpec.com.tw)

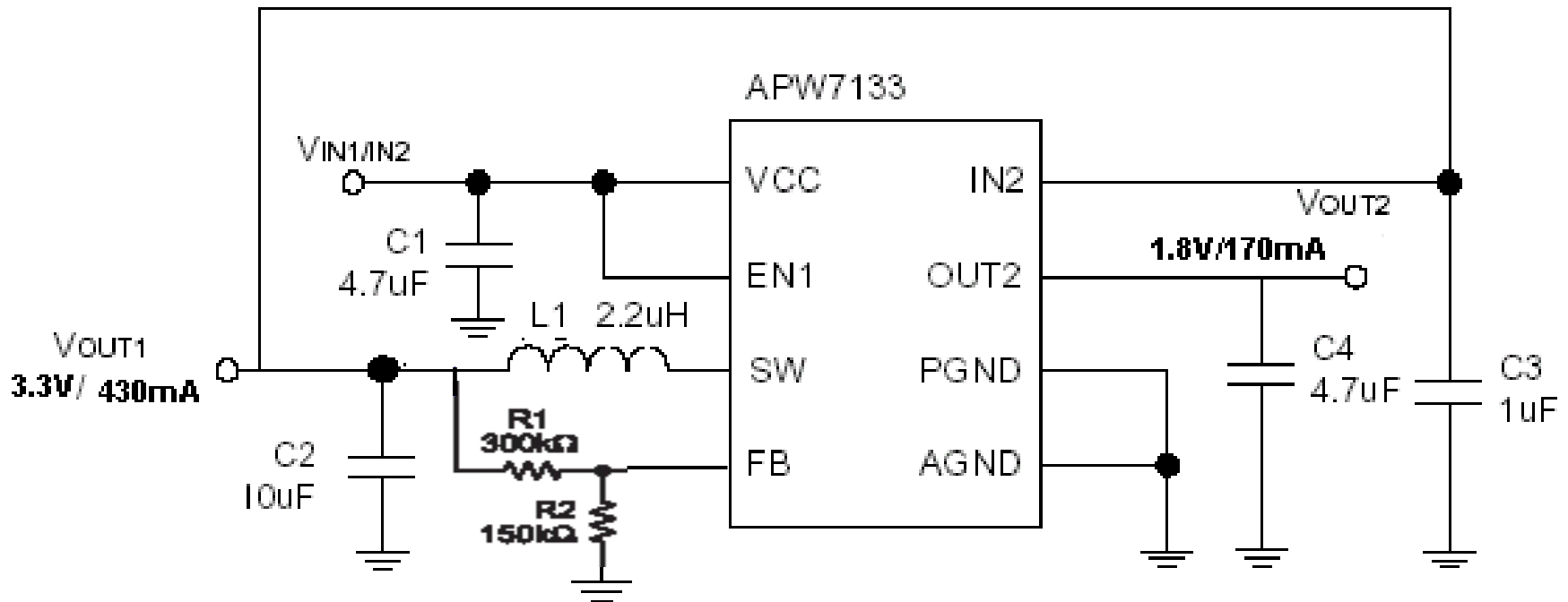
SPEC.	APW7101	LTC3406	XCS921	TPS62200
	ANPEC	LINEARTEK	TOREX	TI
PWM TYPE	Sync. Buck	Sync. Buck	Sync. Buck	Sync. Buck
Input Supply Range	2.5V~5.5V	2.5V~5.5V	2.5V~5.5V	2.5V~6V
I <sub>OUT</sub>	600mA	600mA	300mA	300mA
Quiescent Current	300uA	300uA	70uA	15uA
Reference Voltage	0.6V	0.6V	0.5V	0.5V
F <sub>OSC</sub>	1.5MHz Fixed	1.5MHz Fixed	1.2MHz Fixed	1MHz Fixed
R <sub>DS(ON)_P</sub>	0.5Ω Max	0.5Ω Max	1.2Ω Max	0.69Ω Max
R <sub>DS(ON)_N</sub>	0.45Ω Max	0.45Ω Max	1.4Ω Max	0.54Ω Max
V <sub>RUN</sub>	1V	1V	/	/
I <sub>PK</sub>	1A	1A	500mA	480mA
Low Dropout Operation	100%Duty Cycle	100%Duty Cycle	100%Duty Cycle	100%Duty Cycle
Package	SOT-23 5	Low Profile (1mm) Thin SOT-23 5	SOT-25、USP-6B	Low Profile (1mm) Thin SOT-23 5
Remark			Not P2P APW7101	Not P2P APW7101

## Key Features: *New Product*

- Operate 2.5V to 5V Input voltage
- **600mA** Output current converter + **450mA**(LDO)
- **1.5MHz** Constant Frequency Operation
- **LOW I<sub>q</sub> = 300uA**(PSM)
- Low Dropout Operation at **100% Duty cycle**
- **0.6V** Low Reference Voltage
- **Over Temperature** and **Over Current** Protection
- **Fixed 1.8V OR 3.3V LDO**
- DFN-10 Pin Package
- Lead Free Available (RoHS Compliant)



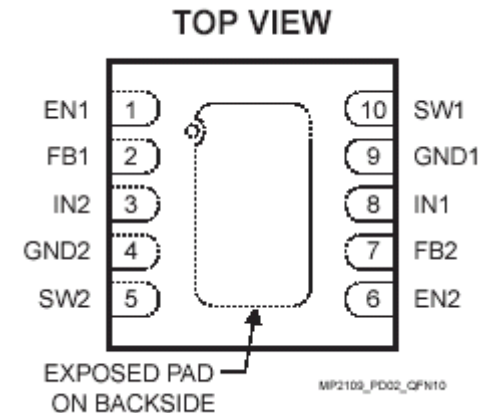
# APW7133 Application Circuit



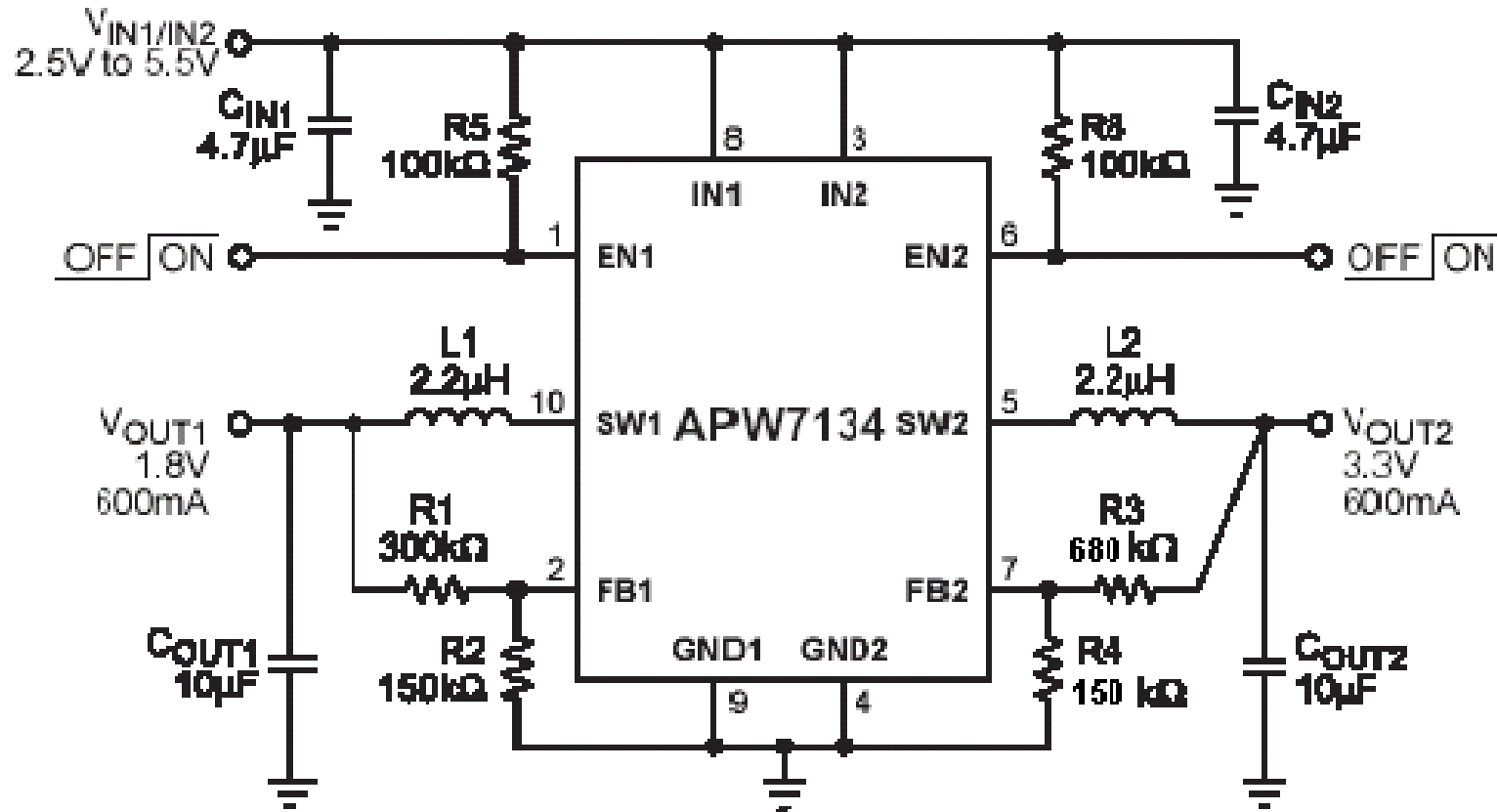
**\*For USB TV Tuner Application**

## Key Features: *New Product*

- **p2p MP2109**
- **Operate 2.5V to 5V Input voltage**
- **600mA /Each Output Current**
- **1.5MHz Constant Frequency Operation**
- **Efficiency up to 93%**
- **LOW  $I_q$  = 300uA/Each(PSM MODE)**
- **Low Dropout Operation at 100% Duty cycle**
- **0.6V Low Reference Voltage**
- **Over Temperature and Over Current Protection**
- **DFN-10 Pin Package**
- **Lead Free Available (RoHS Compliant)**



# APW7134 Application Circuit



# APW7071/2 White LED/OLED Driver



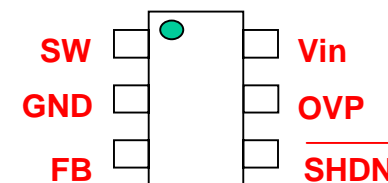
[www.anpec.com.tw](http://www.anpec.com.tw)

## New Product

### Key Features

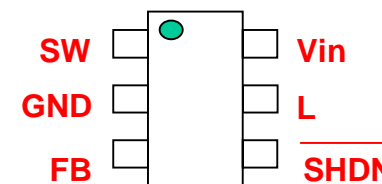
- ▶▶ APW7071 p2p RT9271
- ▶▶ APW7072 p2p TPS61040
- ▶▶ 2.4~6V input voltage range
- ▶▶ 400mA internal switch current
- ▶▶ Up to 1MHZ Switch Frequency
- ▶▶ 70uA Typical No Load Quiescent current
- ▶▶ Internal Soft-start
- ▶▶ Up to 87% Efficiency
- ▶▶ Tiny 6-pin SOT-23 Package
- ▶▶ Built-in PWM dimming control on shutdown pin
- ▶▶ Over Voltage Protection Included (APW7071)
- ▶▶ True Shutdown Included (APW7072)

SOT-26



APW7071

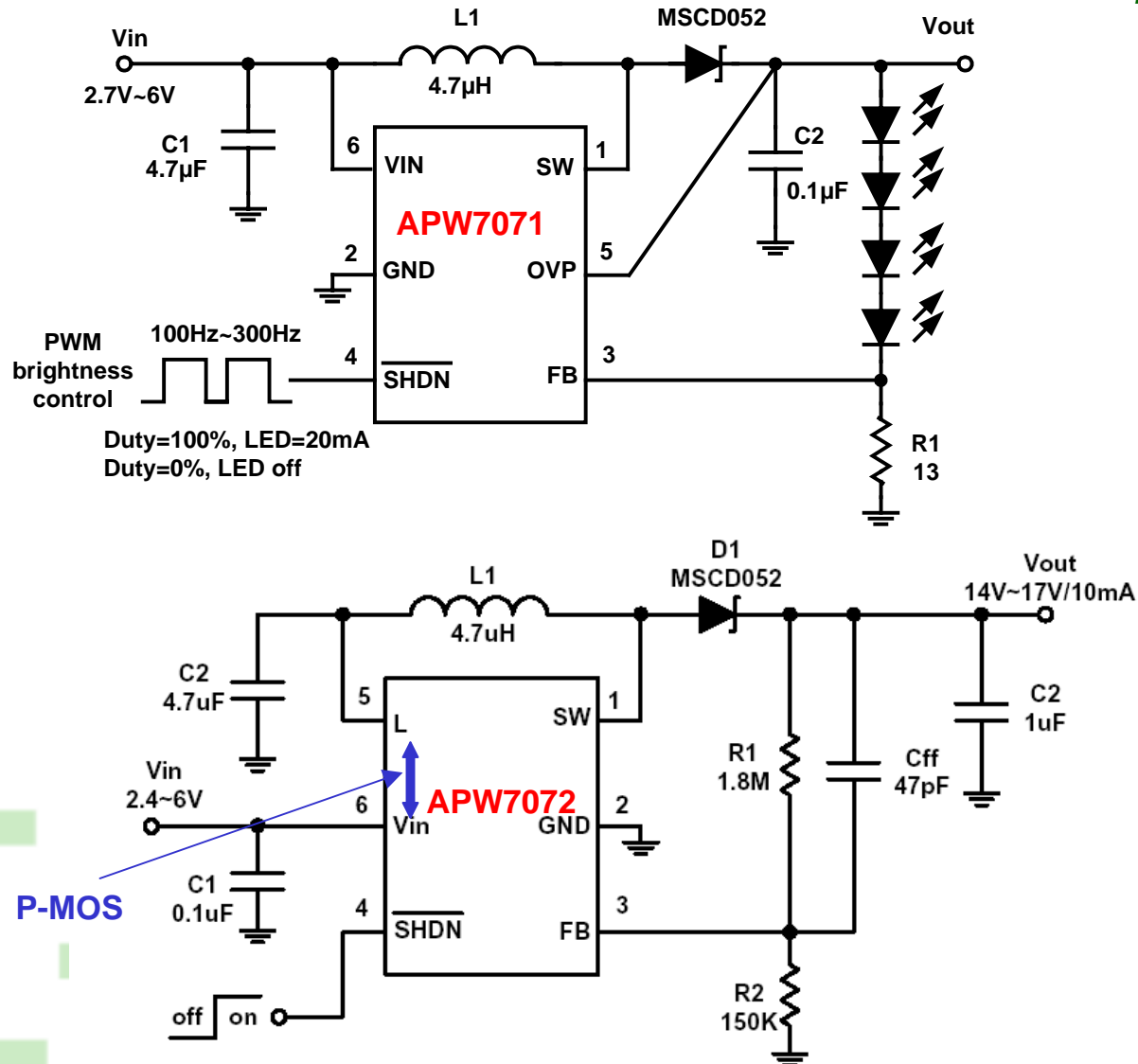
SOT-26



APW7072

# APW7071/2 Application Circuit for W-LED, OLED

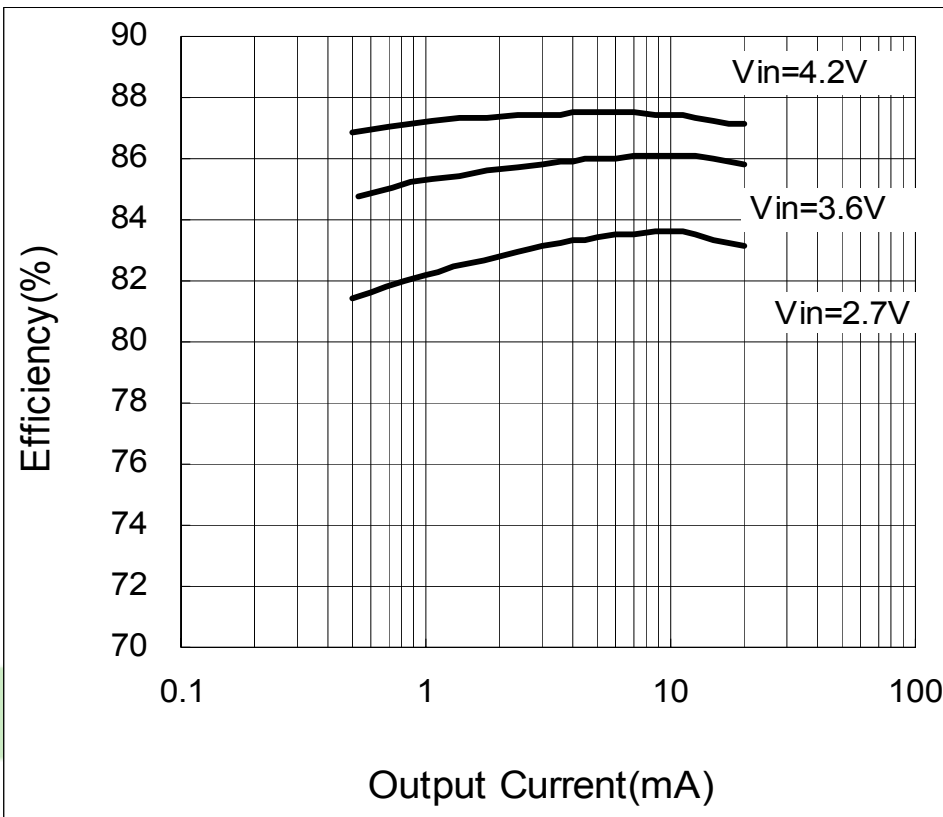
[www.anpec.com.tw](http://www.anpec.com.tw)



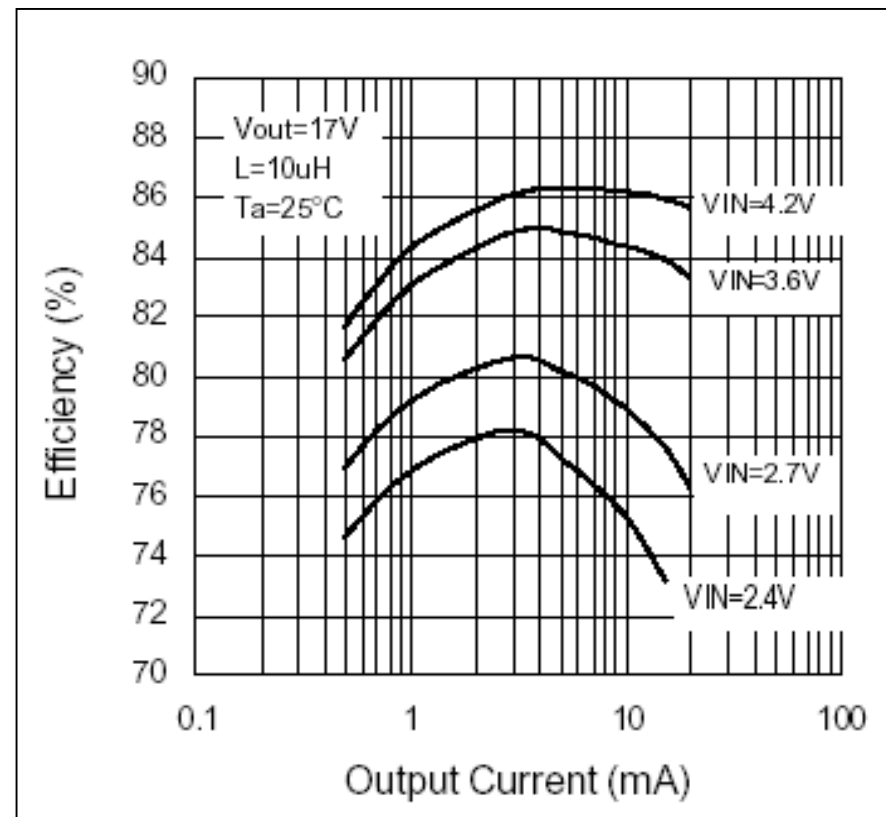


# APW7071/72 Efficiency Chart

APW7071 Efficiency vs. 4LED Current



APW7072 Efficiency vs. LED Current



# Competitor Comparison Table



[www.anpec.com.tw](http://www.anpec.com.tw)

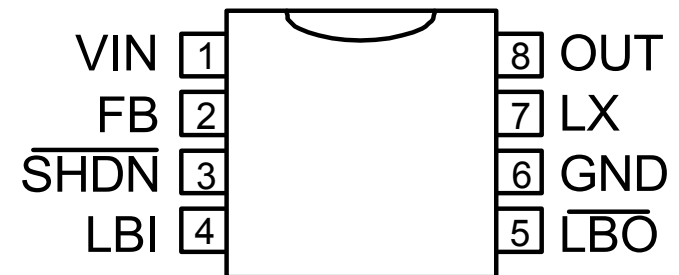
## Backlight LED Driver

	APW7071	APW7072	MP1518	AT1312A/B/C	RT9271	AIC1896
MODE	PFM	PFM	PWM	PWM	PWM	PWM
Vin (Operation)	2.4~6	2.4~6	2.6~6	2.5~6	2.4~6	2.5~10
Vin(max)	7	7	6.5	6.5	7	11
Vout(max)	20	20	28	28/23/16	20	30
Iq(Shutdown)	1uA	1uA	1uA	1uA	1uA	0.5uA
Iq	90uA	90uA	750uA	120uA	120uA	200uA
LED	4	4	6	7	3	8
Sense Resistor	YES	YES	YES	YES	YES	YES
Thermal Shutdown Protection	YES	YES	YES	YES	NO	NO
ON/OFF	YES	YES	YES	YES	YES	YES
Switch (ON) $\Omega$	0.6(TYP.)	0.6(TYP.)	0.5(TYP.)	0.3(TYP.)	0.75(TYP.)	1(TYP.)
Overvoltage Protection	YES	NO	YES	YES	YES	NO
Soft-start	YES	YES	YES	YES	NO	YES(Ext)
Output disconnect	NO	YES	NO	NO	NO	NO
Internal Diode	NO	NO	NO	NO	NO	NO
Eff %	87%	86%	85%	85%	85%	81%
Package	SOT23-6	SOT23-6	TSOT23-6	SOT23-6	SOT23-5/6	SOT23-6
FB(V)	0.25	0.25	0.104V	0.2	0.25	1.23

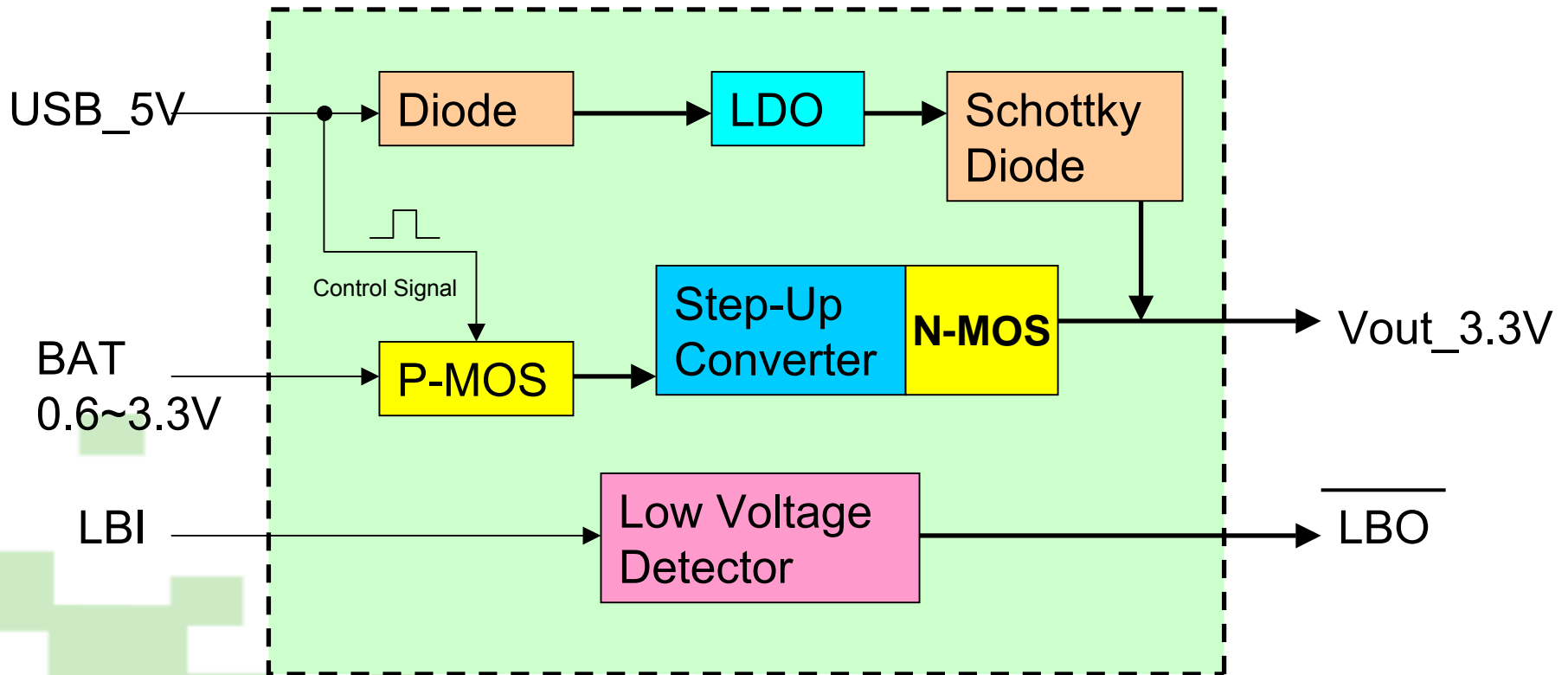
## Key Features

- ▶▶ **Built-in a 500mA LDO and sync. step-up DC-DC converter for dual mode power solution**
- ▶▶ Built-in PWM/PFM operating mode
- ▶▶ Dual input power sources
- ▶▶ 0.6V to 5.5V operating voltage
- ▶▶ Fixed 300kHz operating frequency
- ▶▶ 1V start up input voltage
- ▶▶ **Easy output selection 2.5V, 3.3V and Adj**
- ▶▶ Low battery voltage detection
- ▶▶ **Reverse voltage protection**
- ▶▶ Internal synchronous rectifier
- ▶▶ **High efficiency up to 94% at 200mA output current**
- ▶▶ **Automatic detection input voltage**
- ▶▶ **Compact SOP-8-P and TSSOP-8 Package**

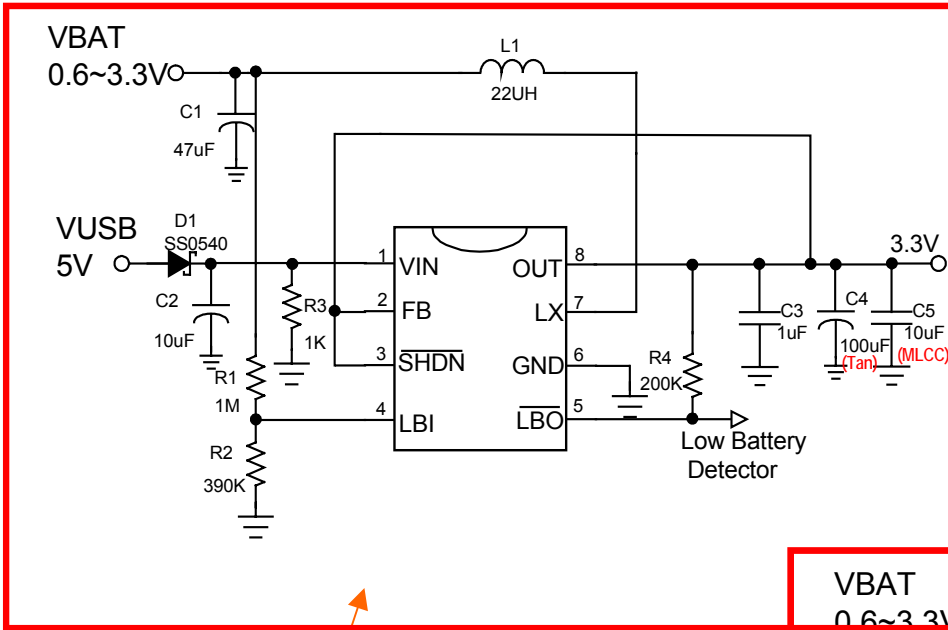
## Pin-outs



# APW7075 Internal Function Block



# APW7075 Application Circuit Schemes



※R3=500~1KΩ

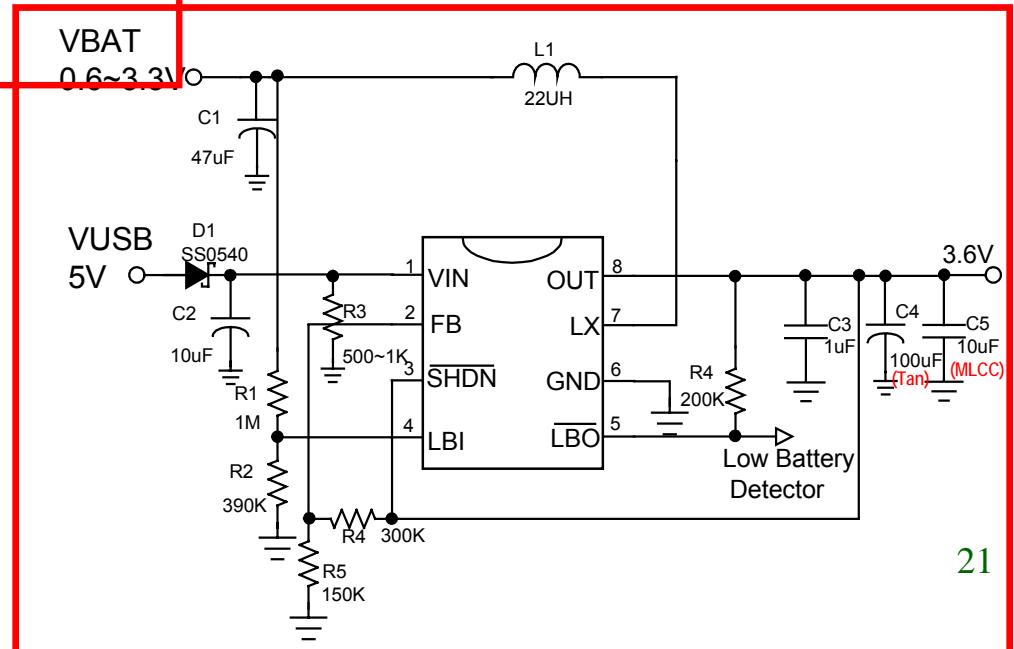
APW7075-3.6V  
(Adj R4 and R5)

FB=Vout ⇒ APW7075-3.3V

FB=GND ⇒ APW7075-2.5V

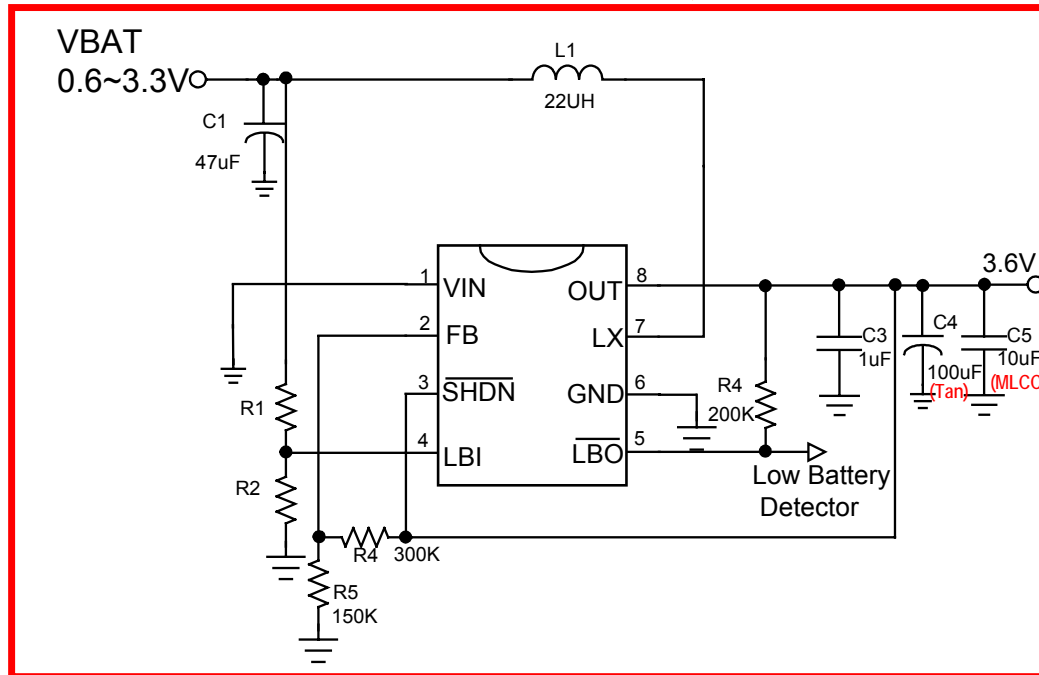
$$V_{out} = 1.2X \left(1 + \frac{R4}{R5}\right)$$

$$V_D = 0.6X \left(1 + \frac{R1}{R2}\right)$$



# APW7075 Single Boost Converter Circuit

APW7075-3.6V  
(Adj R4 and R5)



APW7075-3.3V (FB=Vout)

APW7075-2.5V (FB=GND)

$$V_{out} = 1.2X \left(1 + \frac{R4}{R5}\right)$$

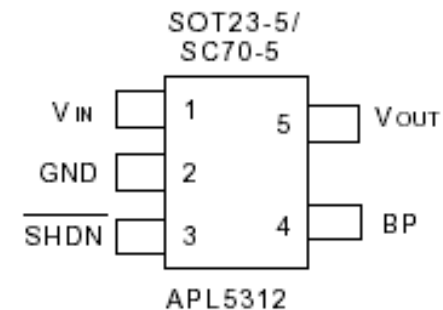
$$VD = 0.6X \left(1 + \frac{R1}{R2}\right)$$

# APL5312 High PSRR LDO

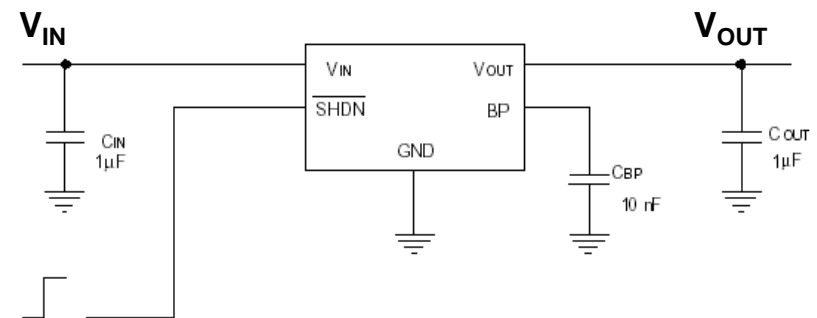
## APL5312 Key Feature:

- Wide Operating **2.3V to 6V** Input voltage
- Low Dropout Voltages: **290mV @ 3V/300mA**
- High PSRR: **74dB** before 10KHz
- Low Output Noise: **36uV<sub>RMS</sub> @ 100~100KHz**
- Current Limit Protection
- Controlled Short Circuit Current: 50mA
- Over Temperature Protection
- Stable With 1uF Capacitor For Any Load
- Excellent Load / Line Transient
- **SOT-23-5 & SC70-5** Packages
- Lead Free Available (RoHS Compliant)

## Pin Configuration



## Typical Application Circuit



# APL5101 Ultra Low $I_Q$ LDO

## APL5101 Key Feature:

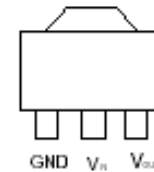
- Ultra Low Quiescent Current: **4uA**
- Low Dropout Voltages: **200mV @ 3.3V/150mA**
- Current Limit Protection
- Controlled Short Circuit Current: 50mA
- Build in Thermal Protection
- Stable With 1uF Output Capacitor
- Guaranteed 150mA Output current
- **SOT-23, SOT-23-5 and SOT-89 Packages**
- Lead Free Available (RoHS Compliant)

## Pin Configuration

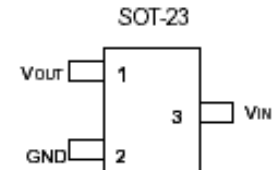


APL5101

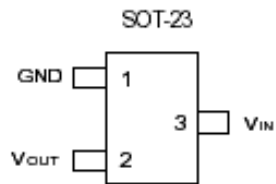
SOT-89



APL5101

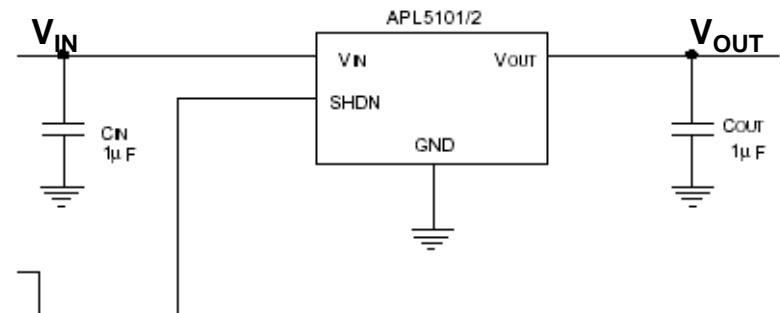


APL5101



APL5102

## Application Circuit





# APL5501 Low $I_Q$ 、 Low dropout LDO

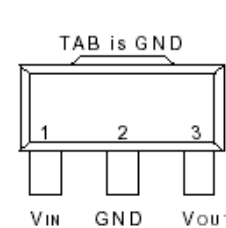
[www.anpec.com.tw](http://www.anpec.com.tw)

## APL5501 Key Feature:

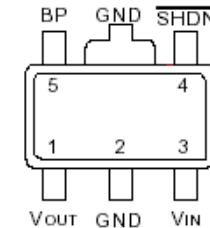
- Low Noise:  $50\mu V_{RMS}$  (100Hz~100KHz)
- Low Quiescent Current: **50uA**
- Low Dropout Voltages: **170mV @ 500mA**
- Reverse Current Protection
- Current Limit Protection
- Build in Thermal Protection
- Stable With 4.7uF Output Capacitor
- Controlled Short Circuit: 150mA
- **SOT-23-5, SOT-89, SOT-89-5, SOT-223, SO-8,**  
**To-252 & TO252-5 Packages**
- Lead Free Available (RoHS Compliant)

## Pin Configuration

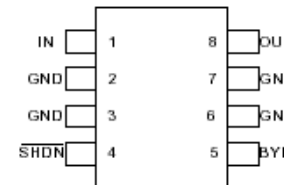
APL5501



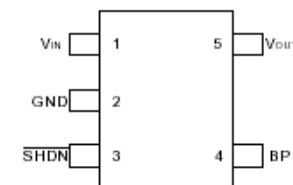
SOT-89 (Top View)



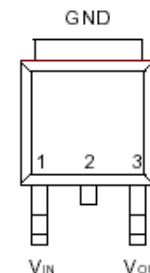
SOT-89-5 (Top View)



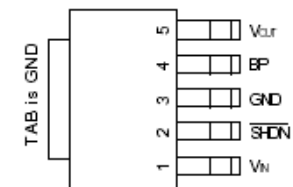
SO-8 (Top View)



SOT-23-5 (Top View)



TO-252 (Top View)



TO-252-5 (Top View)

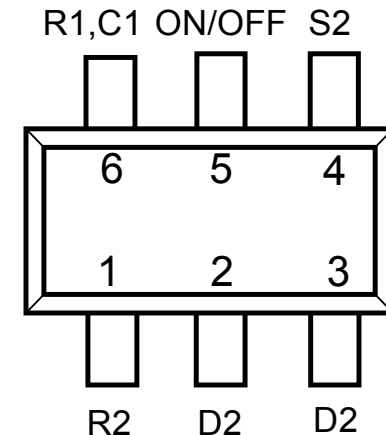
# Load Switch APM2702CG

## New Product

### Key Features

- **-12V/±3A**
- $R_{DS(on)} = 45m\Omega$  (TYP.) @  $V_{GS} = -4.5V$
- $R_{DS(on)} = 60m\Omega$  (TYP.) @  $V_{GS} = -2.5V$
- $R_{DS(on)} = 82m\Omega$  (TYP.) @  $V_{GS} = -1.8V$
- JSOT6 Compact Package
- Lead free Available (ROHS Compliant)

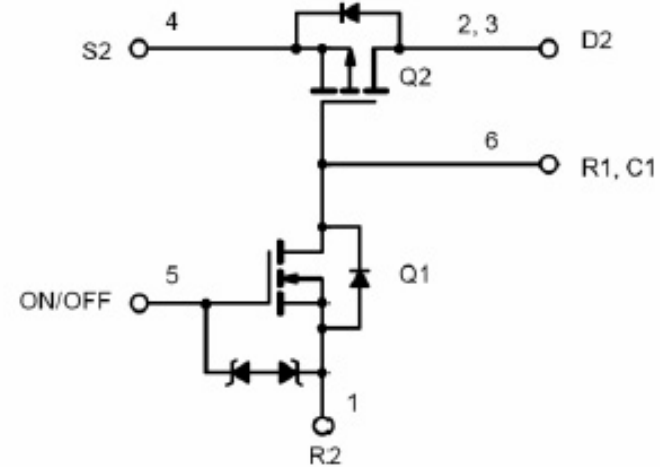
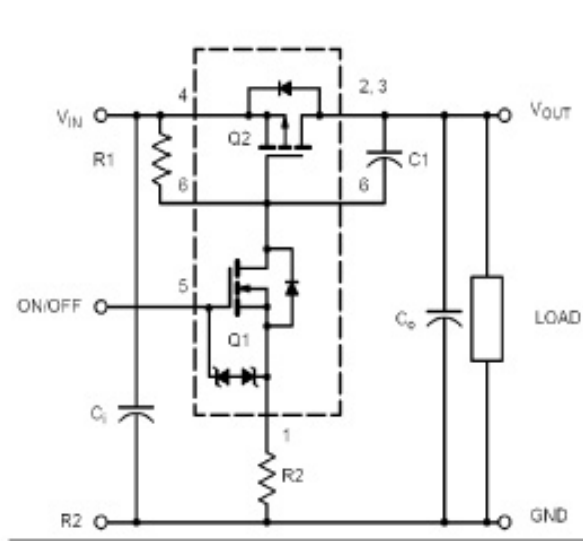
### Pin-outs



# Load Switch APM2702CG

[www.anpec.com.tw](http://www.anpec.com.tw)

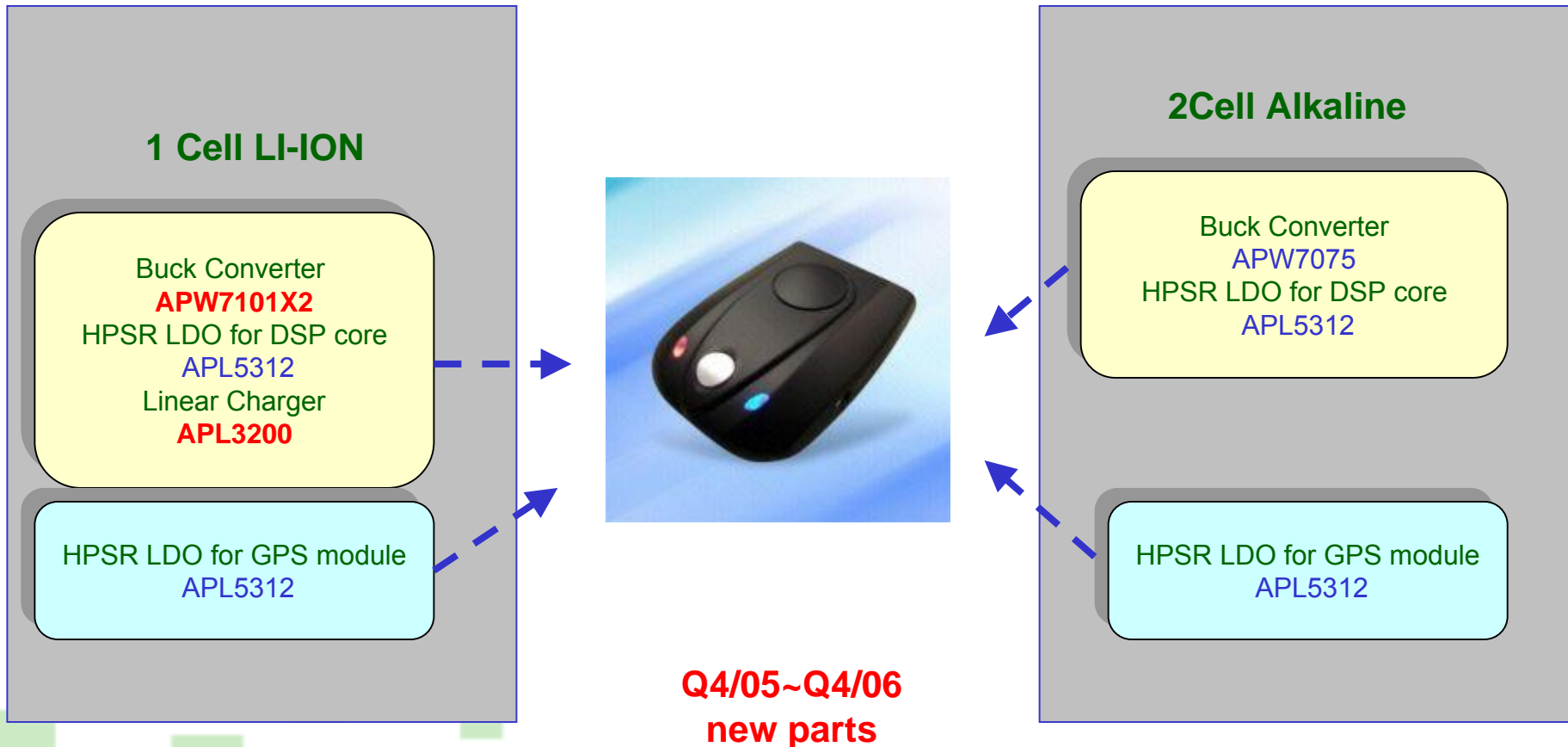
## New Product



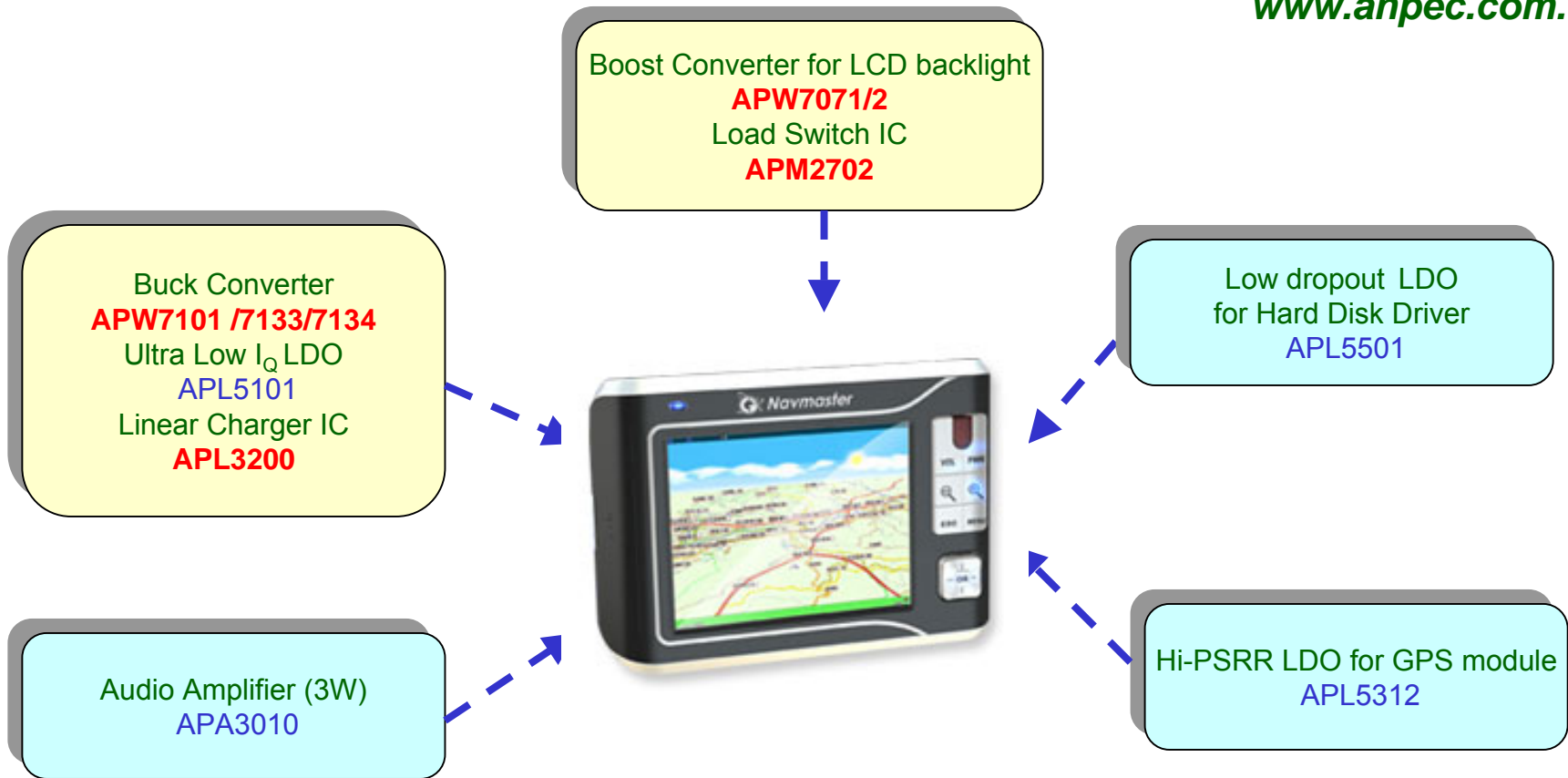
### How to select external Components

- For Applications  $C_o < 1\mu F$
- For slew rate control, select R2 in the range of 1K~4.7K $\Omega$
- For additional inrush current control, C1<1000pF can be added
- Select R1 so that the R1/R2 ratio ranges from 10~100. R1 is request to turn Q2 off

# GPS Handheld Power Topology and Roadmap



# GPS+Navigation/PDA Power Topology and Roadmap



**Q4/05~Q4/06  
 new parts**