



DESCRIPTION

The PM1299 is a complex 3-channel power management unit (PMU).

The PM1299 include one independent input for very low dropout regulator (LDO) and 1A high efficiency of the Sync Buck DC-DC, and a very unique PWM controller which can be boost, buck or both boost/buck, it can drive MOSFET or cheap cost of BJT.

The PM1299 can be flexible for design, for example, two buck and one LDO, or one buck, one boost and one LDO, more than this, PM1299 can apply to be constant current driver of LED backlight.

The PM1299 is available in QFN16 (3x3) packages.

FEATURES

- 1A Sync Buck DC-DC
- One Flexible PWM Controller
- one channel 500mA LDO
- Very small package in QFN16 (3x3) for PCB saving

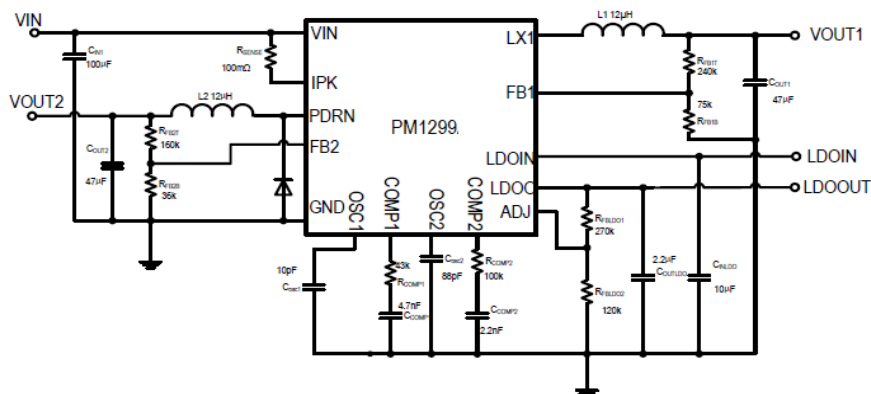
APPLICATION

- 5V supply for ADSL MODEMs
- 5V Supply for STB, IPTV
- Digital Photo Frame, MID, E-book...etc.
- Others single cell Li-on Battery and 5V supply electric products

ORDERING INFORMATION

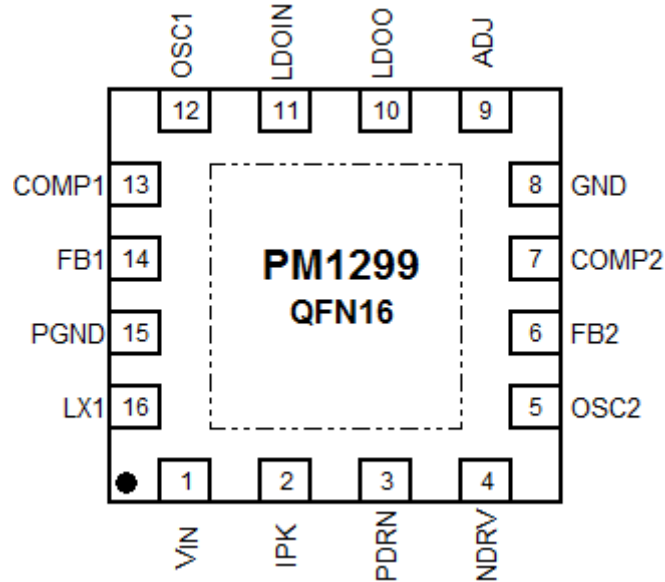
Package Type	Part Number	
QFN16(3x3)	Q16	PM1299Q16R
		PM1299Q16VR
Note	V: Halogen free Package R: Tape & Reel	
AiT provides all RoHS products Suffix “ V ” means Halogen free Package		

TYPICAL APPLICATION





PIN DESCRIPTION



Top View

Pin #	Symbol	Function
1	V _{IN}	Input pin, Recommended 100uF electrolytic capacitor 10uF parallel capacitor pottery connected to PGND
2	IPK	Over current detection terminal
3	PDRN	PWM Controller's control terminal
4	NDRV	PWM Reverse control terminal controller
5	OSC2	PWM External capacitor terminal controller oscillation
6	FB2	PWM Controller feedback voltage terminal
7	COMP2	PWM Feedback compensation controller side
8	GND	GND Pin and PGND short
9	ADJ	LDO Feedback.
10	LDOO	LDO Output, here 2.2uF ceramic capacitor must be connected to GND.
11	LDOIN	LDO Input, here 10uF ceramic capacitor must be connected to GND.
12	OSC1	Synchronous Buck oscillating external capacitor terminal.
13	COMP1	Feedback compensation side synchronous buck .
14	FB1	Synchronous buck feedback.
15	PGND	Power ground terminal
16	LX1	Synchronous buck inductor terminal



ABSOLUTE MAXIMUM RATINGS

Note: Exceeding these limits may damage the device. Long-term work in the limit Will affect the device reliability and lifetime.

V _{IN} to GND	-0.3V~6V
LX1, IPK, PDRN, NDRV to GND	-0.3V~V _{IN} +0.3V
OSC1/2, FB1/2, COMP1/2 to GND	-0.3V~V _{IN} +0.3V
LDOIN, LDOO, ADJ to GND	-0.3V~V _{IN} +0.3V
PGND to GND	-0.3V~+0.3V
L _x to GND Current	Internal limit
P _D	1.0W
Operating Temperature Range	-40°C~85°C
Storage Temperature Range	-55°C~ 150°C

Stress beyond above listed "Absolute Maximum Ratings" may lead permanent damage to the device. These are stress ratings only and operations of the device at these or any other conditions beyond those indicated in the operational sections of the specifications are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.



ELECTRICAL CHARACTERISTICS

$V_{IN}=5V$, $T_A= 25^{\circ}C$, unless otherwise noted.

Parameter	Conditions	Min	Typ.	Max	Unit
Overall					
Input voltage Range		3		5.5	V
Input DC Supply Current	All channels open with no load		10		mA
Over-Temperature Shutdown Threshold			160		$^{\circ}C$
Over-Temperature Shutdown Hysteresis			15		$^{\circ}C$
Synchronous Buck					
Regulated Reference Voltage	$V_{OUT} = 2.5$ to $5V$		0.6		V
Feedback Pin Input Current			10		nA
Output Voltage Range		0.6		5	V
Load Regulation			0.001		%/mA
Line Regulation	$V_{IN} = 2.7$ to $5.5V$		0.04		%/V
Oscillation Frequency			200		KHz
Minimum switching time			100		ns
NMOS RDS(ON)	$I_{SW} = 500mA$		0.15		Ω
PMOS RDS(ON)	$I_{SW} = 500mA$		0.15		Ω
Switch current limit			1		A
PWM Controller					
Regulated Reference Voltage	$V_{OUT} = 2.5$ to $5V$		0.6		V
Feedback Pin Input Current			10		nA
Output Voltage Range		0.6			V
Load Regulation			0.001		%/mA
Line Regulation	$V_{IN} = 2.7$ to $5.5V$		0.04		%/V
Oscillation Frequency			200		KHz
Minimum switching time			100		ns
Maximum output current	$R_{SENSE} = 100m\Omega$			1	A
Internal power MOSFET resistance	$I_{PDRN} = 500mA$		0.15		Ω
Control terminal resistor drive resistance	$I_{NDRV} = 500mA$		5		Ω
	$I_{NDRV} = -500mA$		5		



Parameter	Conditions	Min	Typ.	Max	Unit
Low dropout linear regulator					
Input Voltage Range		2.6		5.5	V
Quiescent Current			30		μA
Input Shutdown Current				1	μA
Feedback Voltage		0.98	1.00	1.02	V
Output Voltage Range		1		$V_{IN}-0.2$	V
Maximum Output Current				500	mA
Output current Limit		0.5			A
Short Current	$V_{OUT}=0V$		0.3		A
Minimum Dropout Voltage	$I_{OUT}=500mA$		400		mV
Load Regulation	$I_{OUT}=0-300mA$		20		mV
Line Regulation	$V_{OUT}=3.0V$ $V_{IN}=3.6$ to $5.5V$		0.015		%/V

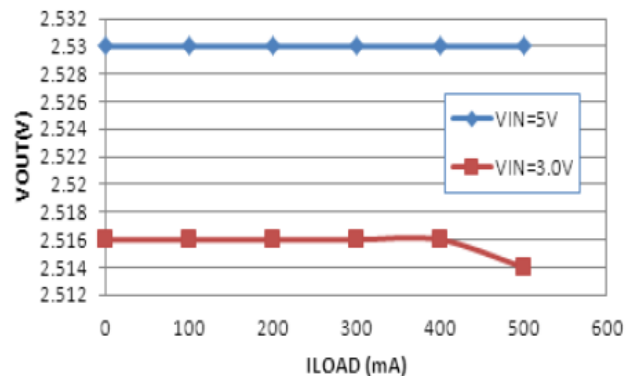
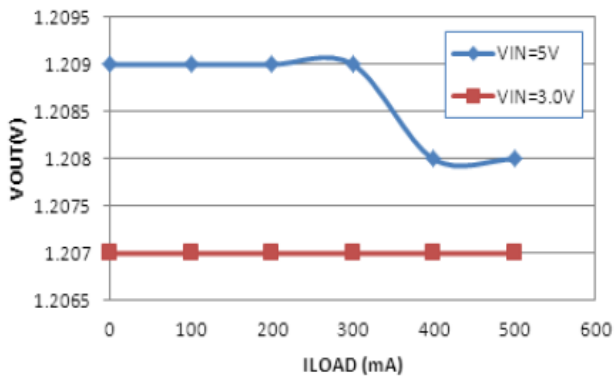


TYPICAL PERFORMANCE CHARACTERISTICS

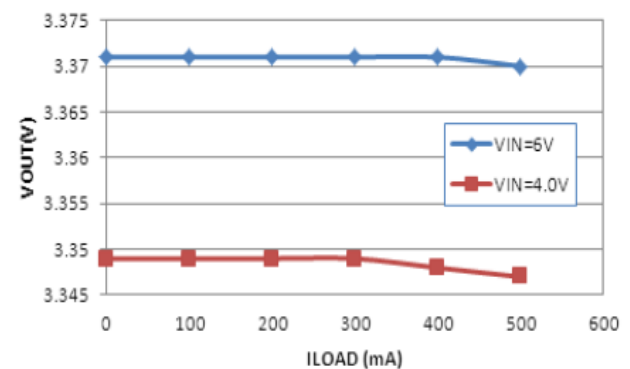
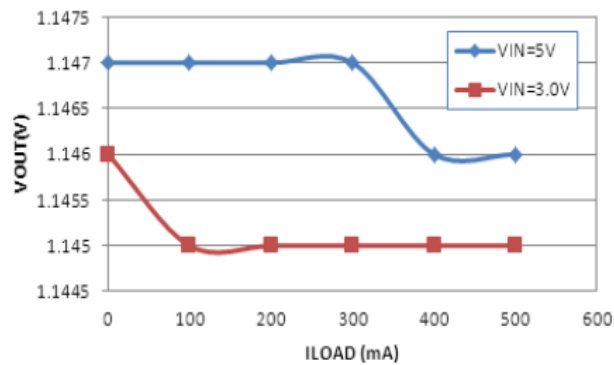
$V_{IN}=5V$, $T_A=25^{\circ}C$, unless otherwise noted.

Output voltage varies with the load curve

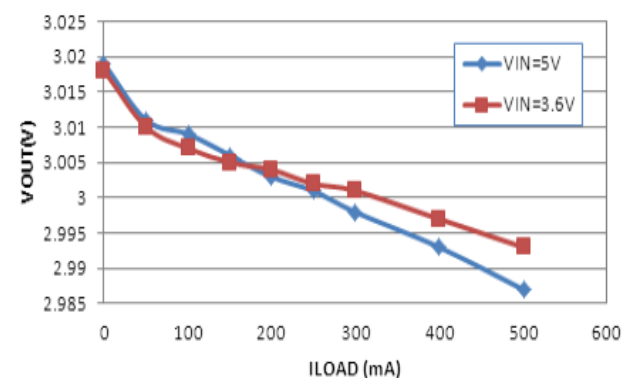
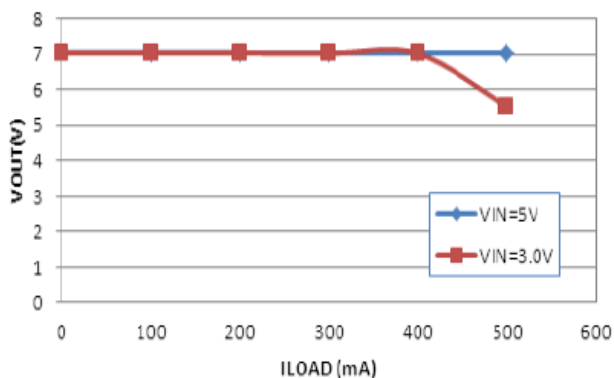
1. BUCK1 output voltage vs. I_{LOAD} V_{OUT} set to 1.2V
2. BUCK1 output voltage vs. I_{LOAD} V_{OUT} set to 2.5V



3. BUCK2 output voltage vs. I_{LOAD} V_{OUT} set to 1.2V
4. BUCK2 output voltage vs. I_{LOAD} V_{OUT} set to 3.3V

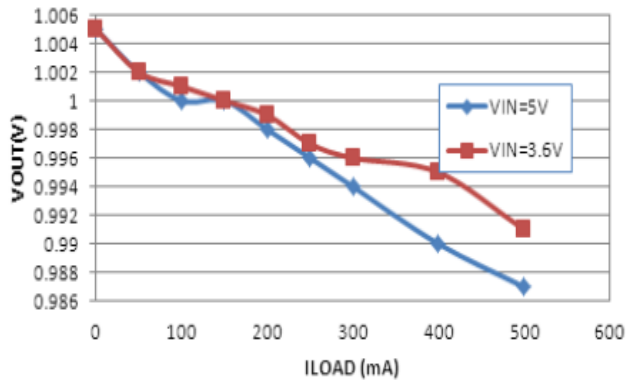


5. BOOST output voltage vs. I_{LOAD} V_{OUT} set to 7V
6. LDO output voltage vs. I_{LOAD} V_{OUT} set to 3.0V



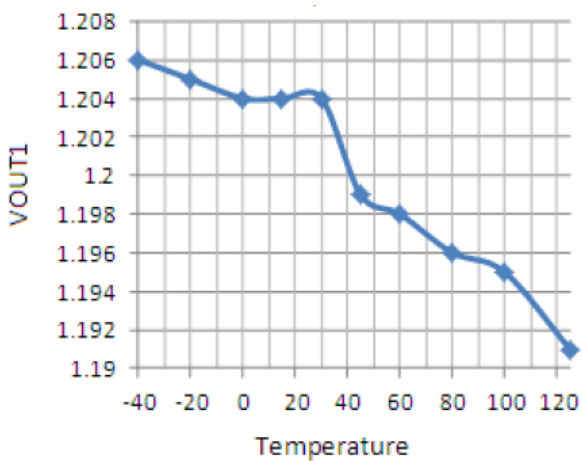


7. LDO output voltage vs. I_{LOAD} V_{OUT} set to 1.0V

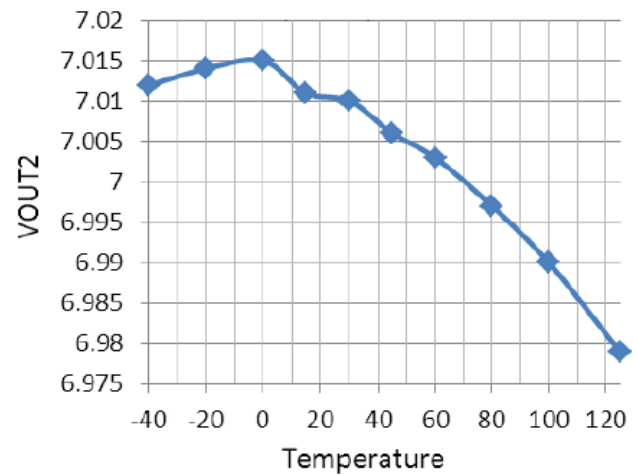


Output voltage and oscillation frequency versus temperature curve

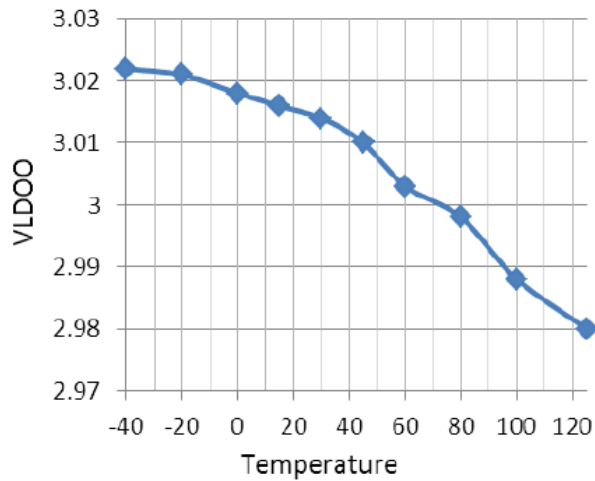
8. V_{OUT1} vs. Temperature @ $V_{IN}=5V$



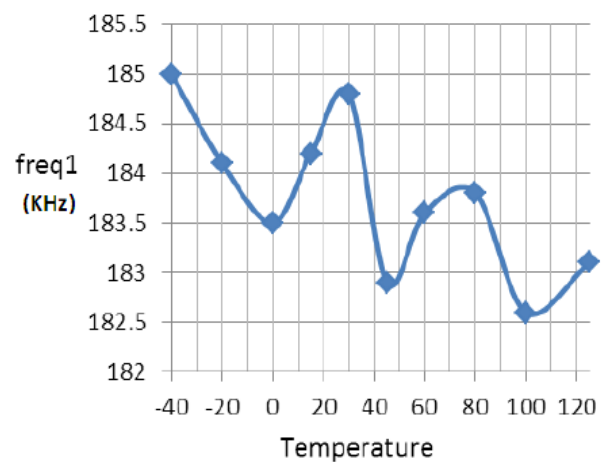
9. V_{OUT2} vs. Temperature @ $V_{IN}=5V$ (boost)



10. VLDOO vs. Temperature @ $V_{IN}=5V$



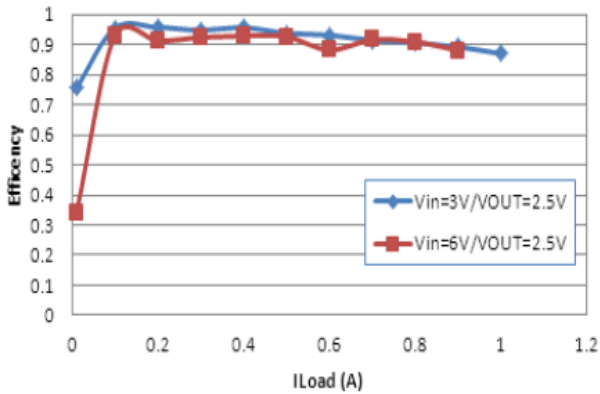
11. Freq1 vs. Temperature @ $V_{IN}=5V$



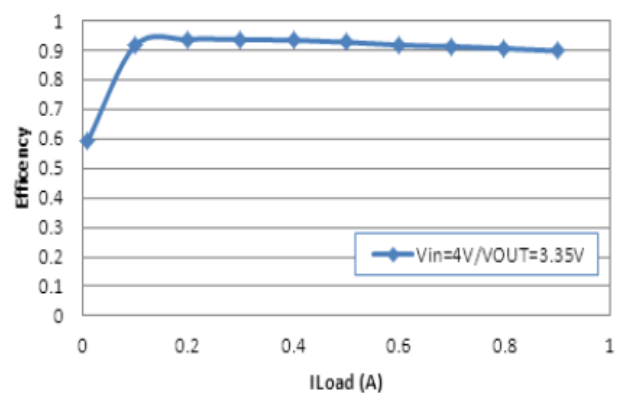


Efficiency versus load current curves

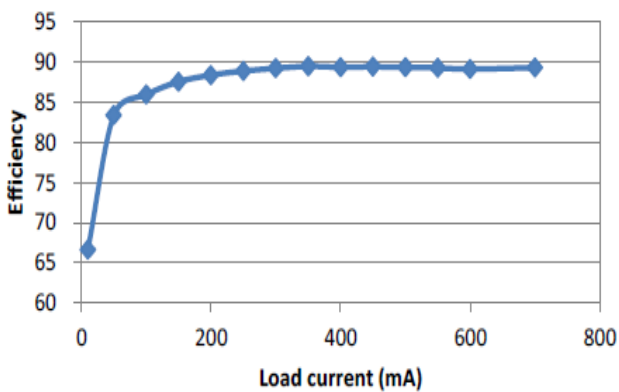
12. BUCK1 Efficiency



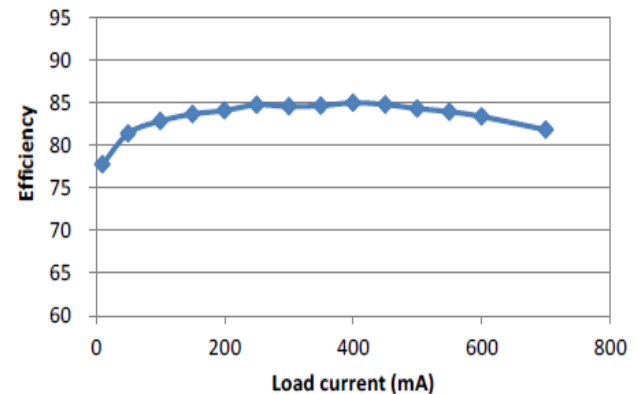
13. BUCK2 Efficiency



14. Efficiency vs. Load @VIN=5V, VOUT2=7V main switch is NMOS

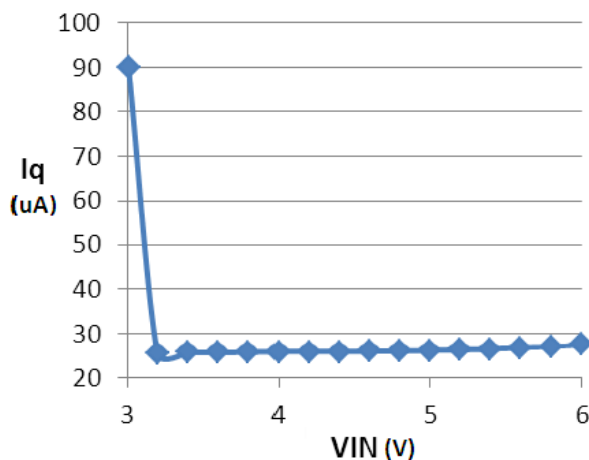


15. Efficiency vs. Load @VIN=5V, VOUT2=7V main switch is NPN(RB=100Ω)

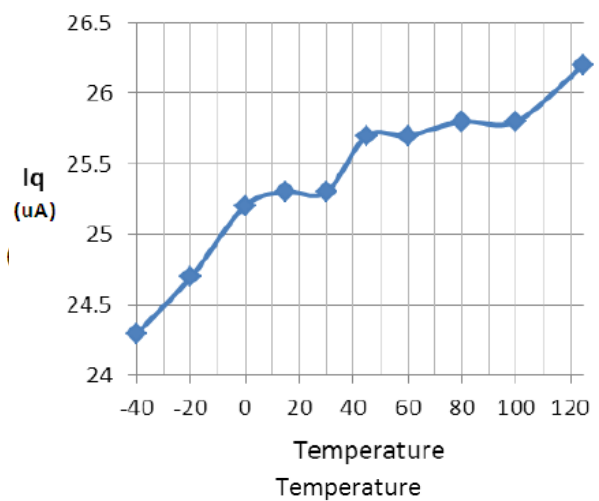


LDO quiescent power with the input voltage and temperature curve

16. Iq(LDO) vs. VIN



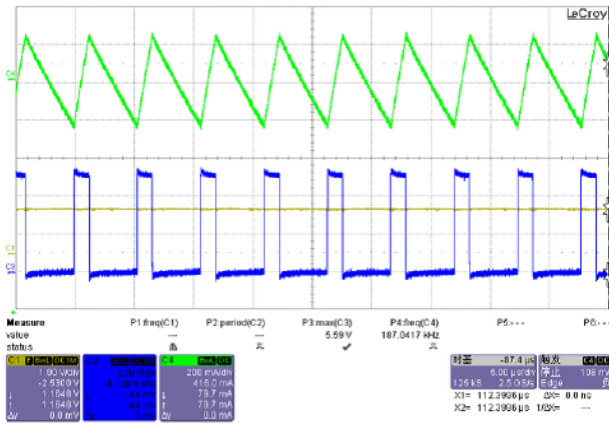
17. Iq(LDO) vs. Temperature @ VIN=5V



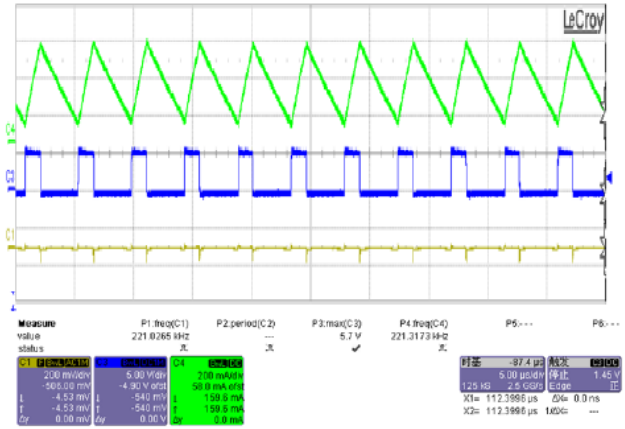


Switching Waveforms

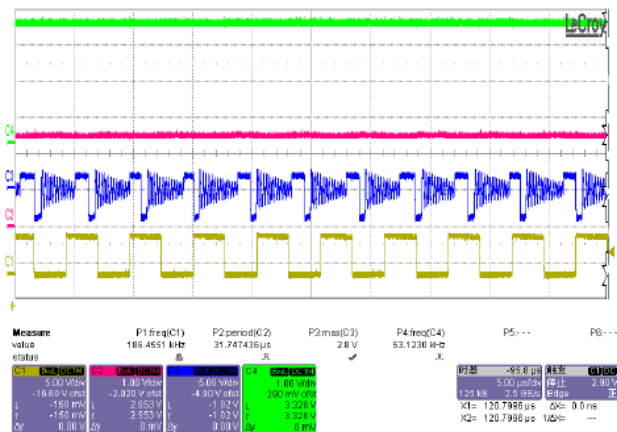
18. Buck1 switching waveform at 1.2V



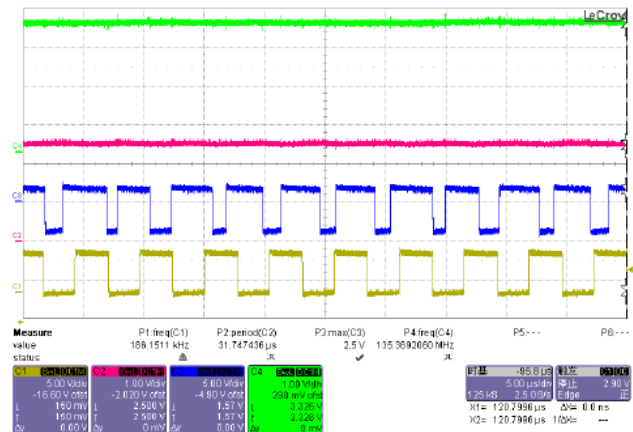
19. Buck2 switching waveform at 1.2V



20. Buck1 and buck 2 switching :Buck2 at light load



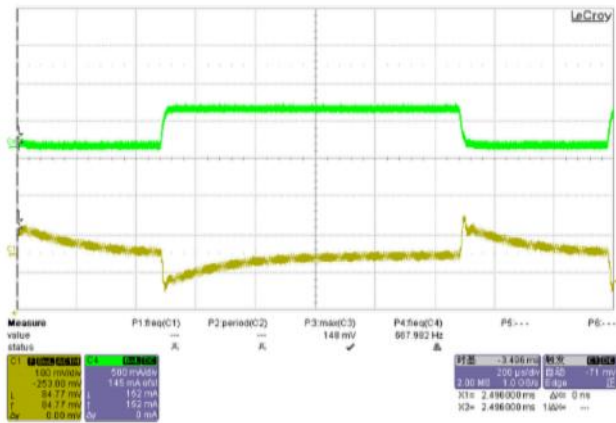
21. Buck1 and buck 2 switching :Both at heavy load





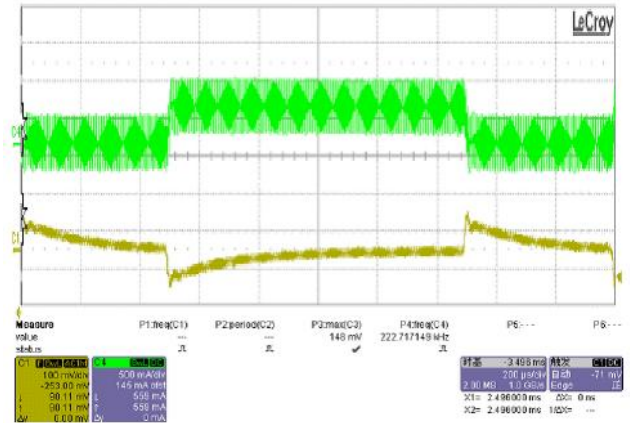
Transient response waveform

22. Buck1 load transient response (Load current)



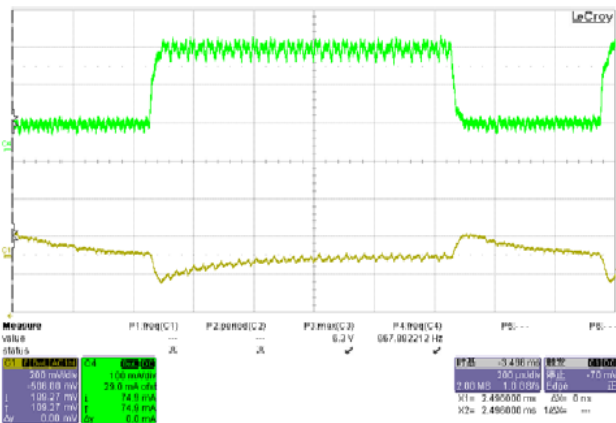
C1:VOUT1 C4:IOUT1

23. Buck1 load transient response (inductor current)



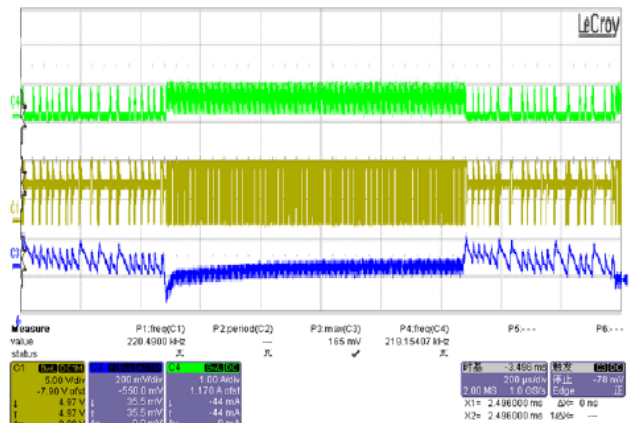
C1:VOUT1 C4:ILX1

24. Buck2 load transient response



C1: VOUT2 C4: IOUT2

25. Boost2 load transient response

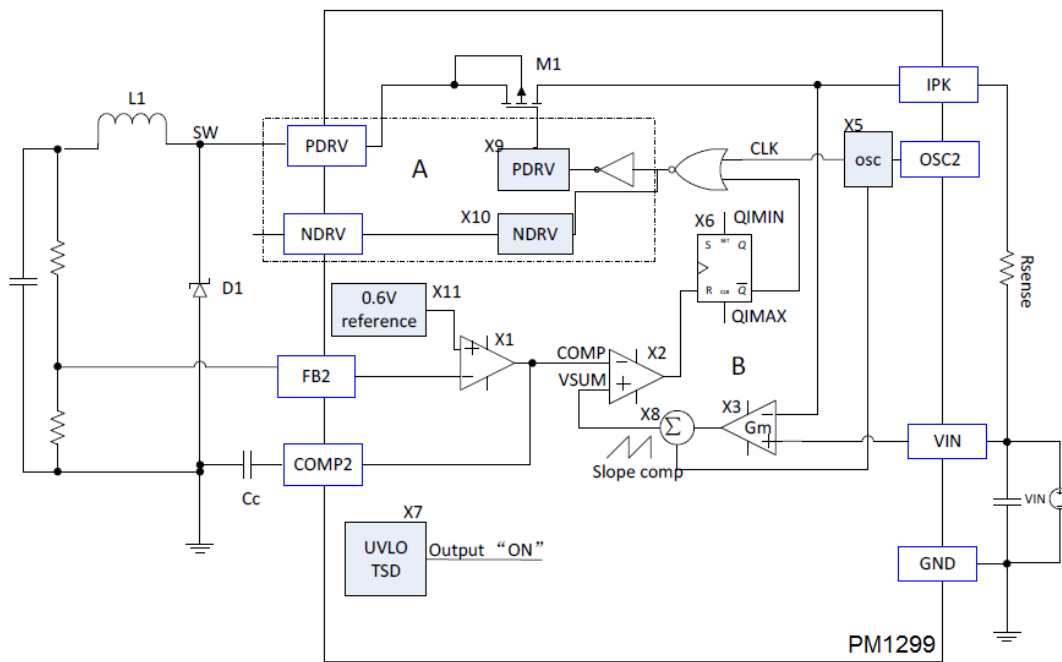


C1: LX2 C3: VOUT2 C4: IOUT2

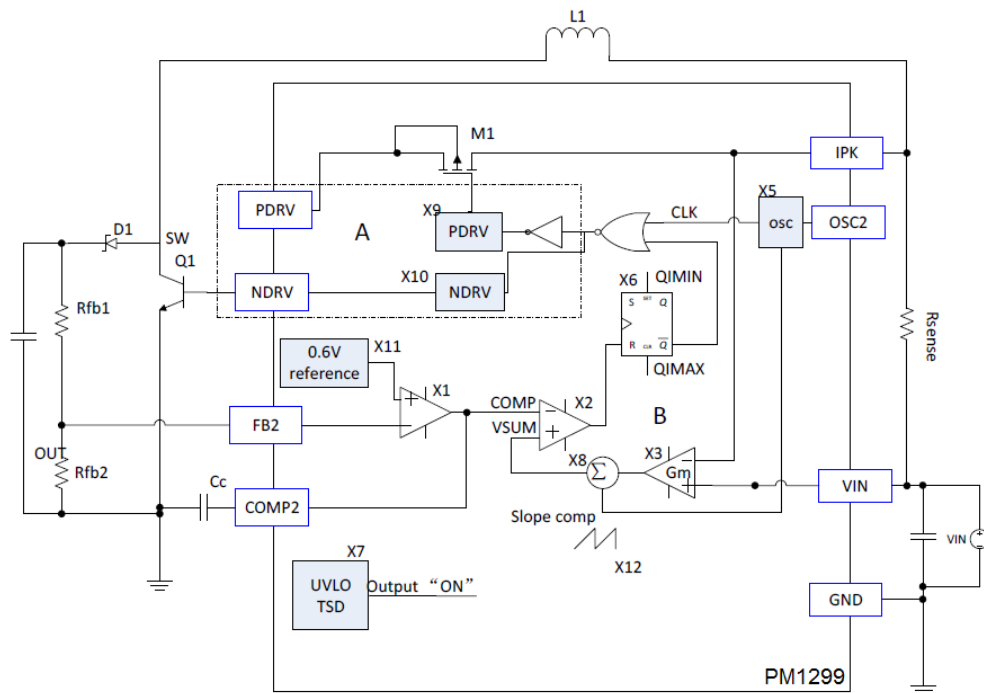


BLOCK DIAGRAM

Buck Configuration



Boost Configuration





DETAILED INFORMATION

PM1299 is a power management unit for the next generation of ADSL and the development of a complete set-top boxes, compact and low-cost single-chip power supply solutions. It integrates a synchronous buck, a LDO, an unique PWM controller.

Synchronous Buck

The synchronous buck channels can provide 1A of output current, Fixed-frequency PWM control, Using current control mode, Feedback can be easily compensated maintain system stability. Synchronous buck not only improve the conversion efficiency, also saves external Schottky diode.

PWM Controller

PM1299 provides a unique, flexible configuration of the PWM controller. It can be set as a buck, boost and buck-boost mode. A control terminal for setting the buck mode, the reverse control terminal for setting the boost and buck-boost mode, however, the two modes of conflict, can only be used in a mode in which a control terminal, make another vacant, two control terminals can not be used simultaneously.

Its reverse drive transistor control terminal can also be driven MOSFET, Making the customer's system costs decline further. It also utilizes a current-sense resistor is used to sense the inductor current, prevent the system from over current occurs. Since the controller itself, therefore need schottky diodes around to complete the work of the boost or buck.

Low Dropout Linear Regulator (LDO)

PM1299 also provides a low dropout, low static power consumption, low operating voltage linear regulator. Its maximum output current of 500mA. The linear regulator has a separate input pin, can take the output synchronous buck channels, thereby greatly improving the overall efficiency, reducing system power consumption.

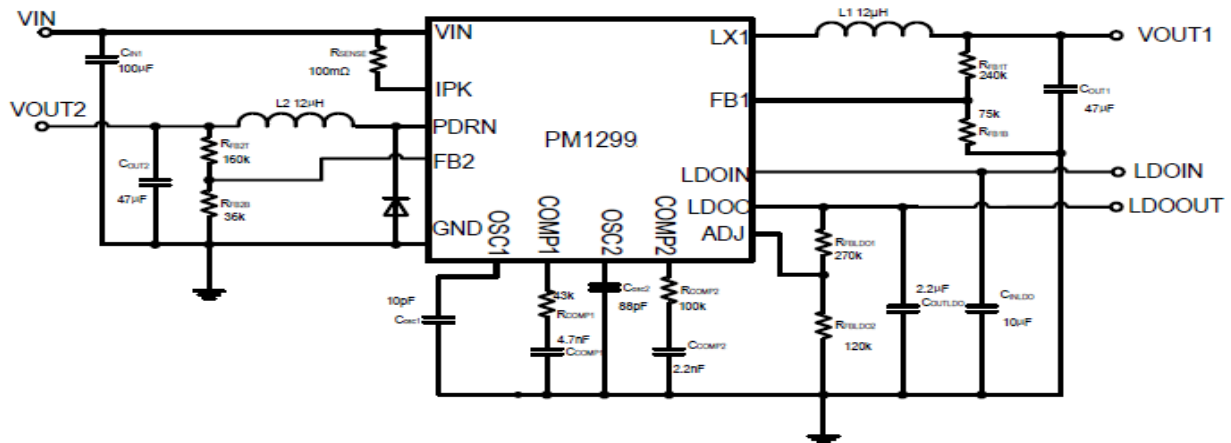
Current control mode

PM1299 using current control mode. Its internal perception of each oscillation cycle inductor current, compensate for the feedback and control circuitry within the system. The mode system stable than the voltage control mode is easy to implement. Therefore, the requirements of the surrounding compensation device can be reduced.

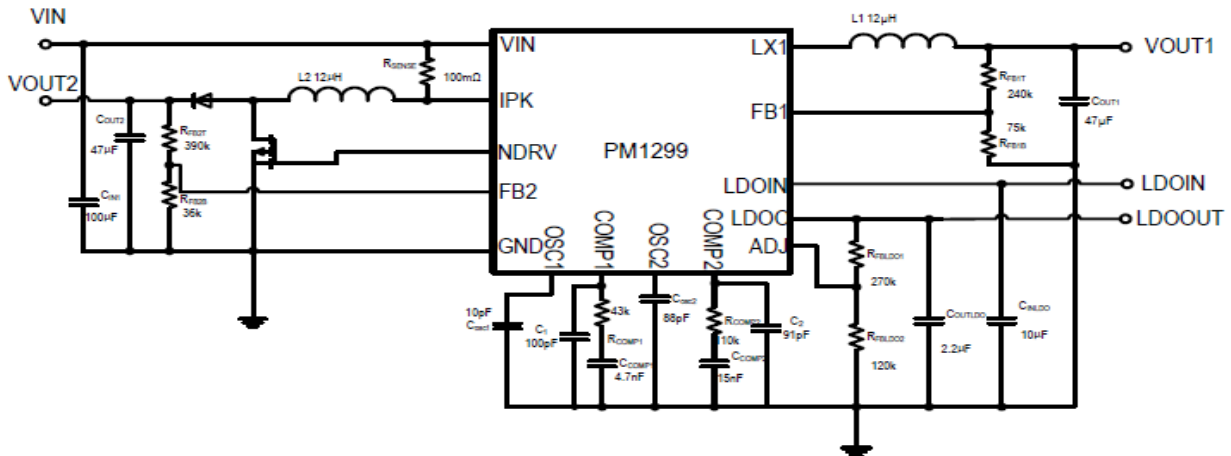


TYPICAL APPLICATION

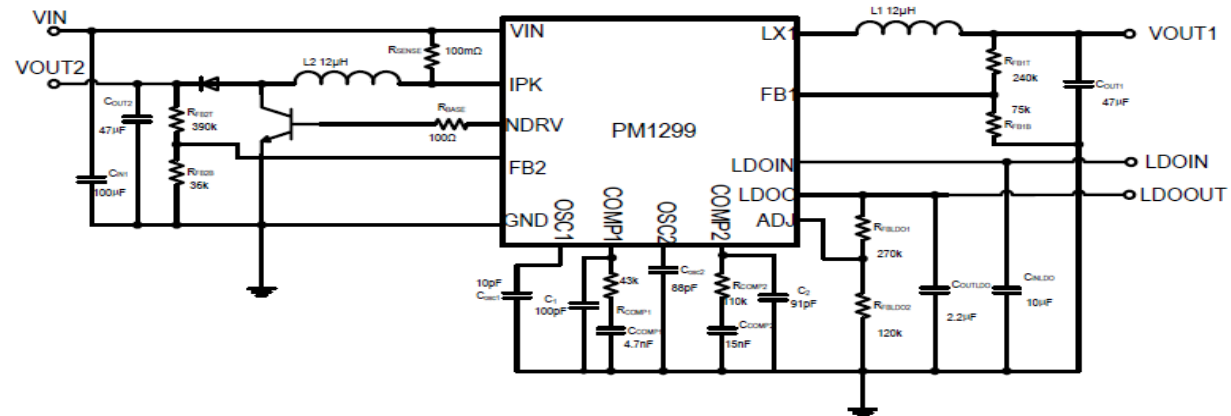
1. PM1299 configured as Two Step-down converters and one LDO



2. PM1299 configured as One step-down, One Step-up(using MOSFET) and one LDO



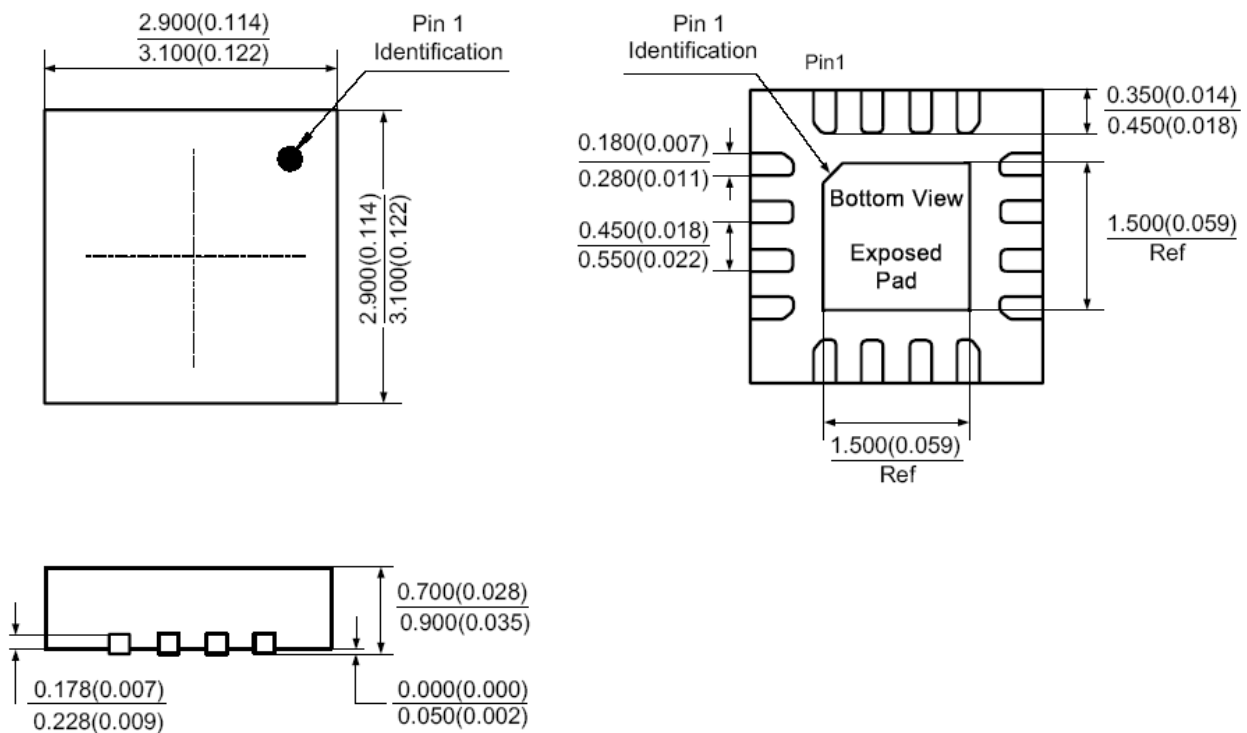
3. PM1299 configured as One step-down, One Step-up(Using NPN) and one LDO





PACKAGE INFORMATION

Dimension in QFN16(3x3) (Unit: mm)





IMPORTANT NOTICE

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