1.2MHZ，14V Step-up DC/DC Converter

GENERAL DESCRIPTION

The XR2204D is a high frequency, high efficiency DC to DC converter with an integrated 4A, 0.1Ω power switch capable of providing an output voltage up to 14V. The fixed 1.2MHz allows the use of small external inductions and capacitors and provides fast transient response. It integrates Soft start, Comp,. only need few components outside.

FEATURES

- 2.3V to 6V input voltage Rangel
- Efficiency up to 96%
- 14V Boost converter with 4A switch current
- 1.2Mhz fixed Switching Frequency
- Integrated soft-start
- Thermal Shutdown
- Under voltage Lockout
- ESD 8KV Pass(HBM)
- 8-Pin SOP-PP Package

APPLICATIONS

- Handheld Devices
- GPS Receiver
- Digital Still Camera
- Portable Applications
- DSL Modem
- PCMCIA Card
- TFT LCD Bias Supply

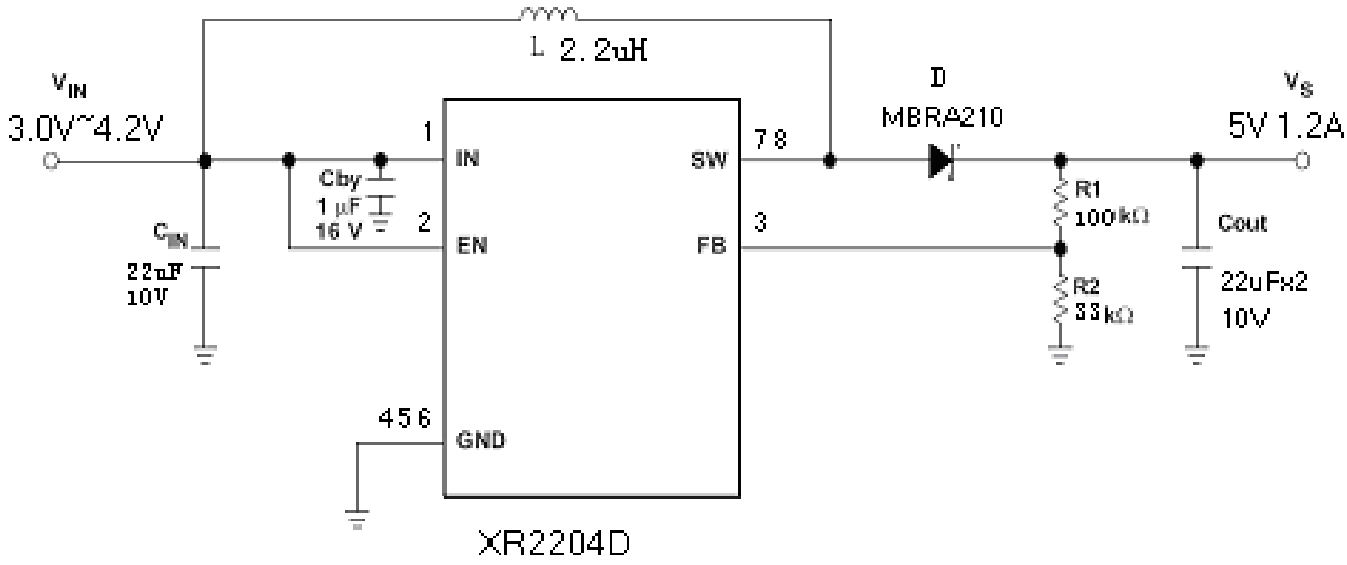


Figure 1. Typical Application Circuit1

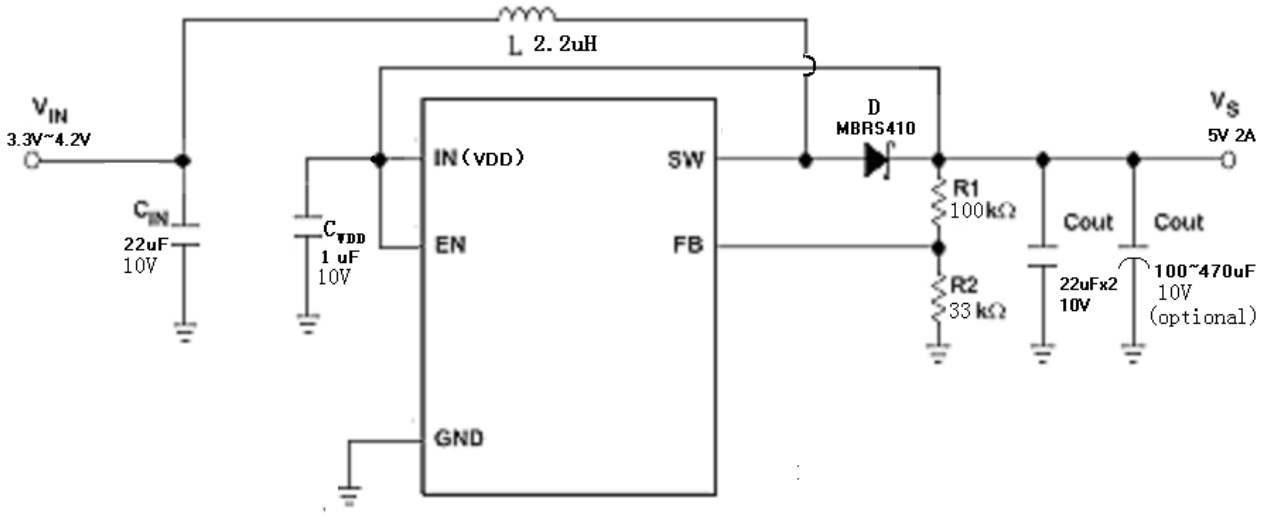


Figure 2. Typical Application Circuit2

ORDERING INFORMATION

PART NUMBER	TEMP RANGE	SWICHING FREQUENCY	OUTPUT VOLTAGE (V)	ILIM (A)	PACKAGE	PINS
XR2204D	-40°C to 85°C	1.2MHZ	ADJ	4	SOP-PP	8

PIN CONFIGURATION

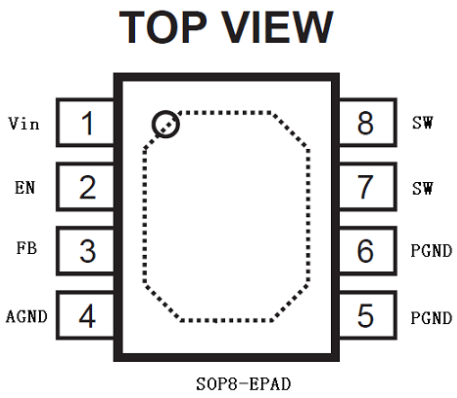


Figure 3. PIN Configuration

PIN DESCRIPTION

PIN NUMBER	PIN NAME	PIN DESCRIPTION
1	Vin	Input power supply pin
2	EN	Shutdown control input., Connect this pin to logic high level to enable the device

3 FB		Feedback pin
4 AGND		Analog ground
5 PGND		Power ground
6 PGND		Power ground
7 SW		Switch pin
8 SW		Switch pin

ABSOLUTE MAXIMUM RATINGS

(Note: Do not exceed these limits to prevent damage to the device. Exposure to absolute maximum rating conditions for long periods may affect device reliability.)

PARAMETER V	ALUE	UNIT
Supply Voltage VIN	-0.3 to 6.5	V
FB, EN Voltage	-0.3 to VIN+0.3	V
SW Voltage	Vin+0.3 to 15V	V
Operating Ambient Temperature	-40 to 85	°C
Maximum Junction Temperature	150	°C
Storage Temperature	-55 to 150	°C
Lead Temperature (Soldering, 10 sec)	300	°C

ELECTRICAL CHARACTERISTICS

(V_{IN} = 3.6V, T_A= 25°C unless otherwise specified)

PARAMETER SYMBOL		TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Voltage Range	V_{IN}	2.3			6.0	V
Boost output voltage range	Vout		14			V
Operating Supply Current	I_{SUPPLY}	V_{FB} =1.5V， EN=Vin, I_{Load} =0	75		135	μA
Shutdown Supply Current		V_{EN} =0V, V_{IN} =4.2V	0.1	1		
Regulated Feedback Voltage	V_{FB}	1.21		1.24	1.27	V
Peak Inductor Current	I_{PEAK}			4.0		A
Oscillator Frequency	F_{OSC}	0.9		1.2	1.5	MHz
Rds(ON) of N-channel FET		I_{SW} =-100mA		0.1	0.2	Ohm
Enable Threshold		V_{IN} = 2.3V to 5.5V	0.3	1	1.5	V

Enable Leakage Current			-0.1		0.1	µA
SW Leakage Current		V_{EN} = 0V, V_{SW} = 0V or 5V, V_{IN} = 5V			1 uA	

DETAILED DESCRIPTION

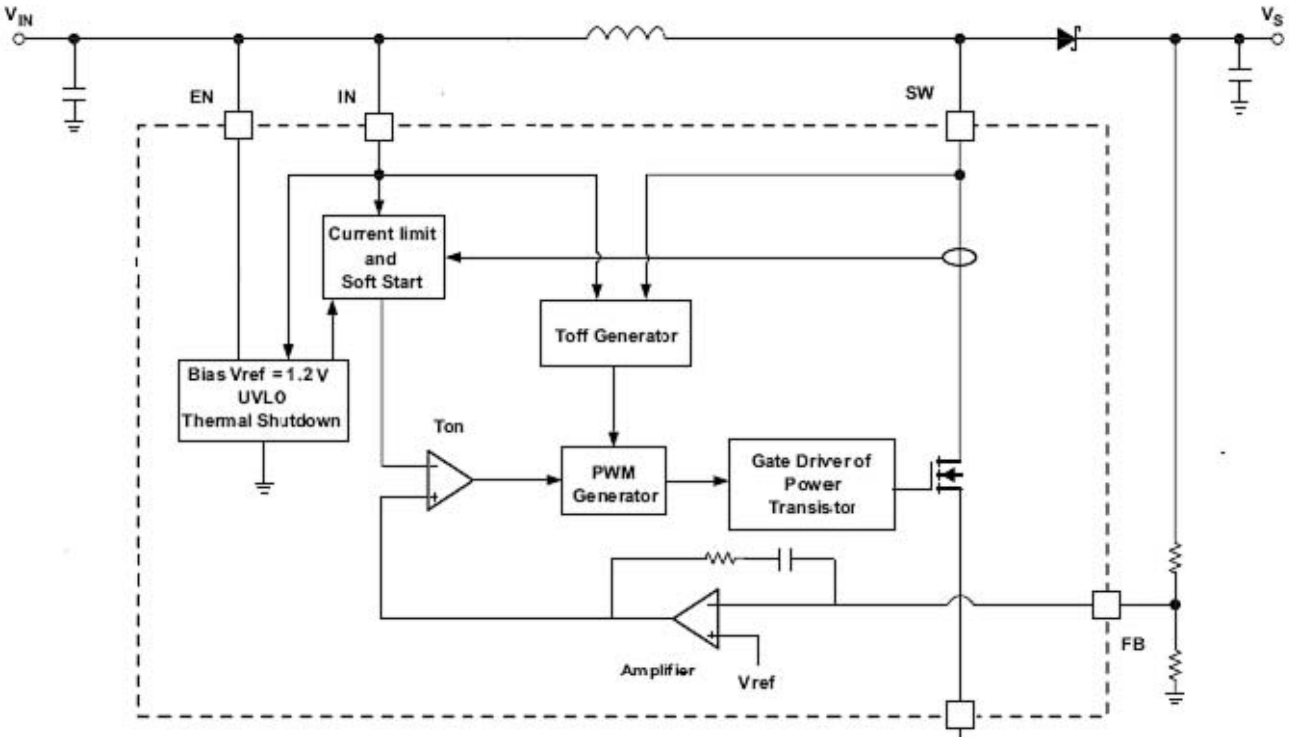


Figure 4. Functional Block Diagram

FUNCTIONAL DESCRIPTION

NORMAL OPERATION

The boo st conve rter is design ed for output voltage up to 14V with a switch pe ak current limit of 4.0 A. The device, whi ch operates i n a current mode scheme with qu asi-constant fre quency, i s externally 1.2MHZ and the minimum input voltage is 2.3 V. To control the inrush current at start-up a soft-start pin is available.

During the on-time, the volt age across the inductor cau ses the cu rrent in it to rise. When the current reaches a threshold value set by the internal GM amplifier, the power transi stor is turned off, the energy stored into the inductor is then released and the curre nt flows thro ugh the Schottky diode towards the output of the boost conve rter. The of f-time is fixed for a cert ain Vin and Vs, and therefore maintains the same f requency when va rying the se parameters.

However, for dif ferent output lo ads, the frequency m ay slightly ch ange due to the volt age drop across the Rd son of the power tran sistor which will have an ef fect on the volt age across the inductor an d thus on T_{on} (T_{off} remains fixed). Some slig ht frequ ency ch anges might also a ppear with a fixed output load due to the fact that the output volt age Vs is not sensed directl y but via the SW Pin, which affects accuracy.

Because of the qu asi-constant freque ncy behavior of the device , the XR22 04D eliminates the need for an intern al oscill ator and slop e

compensation, which provides better stability for the system over a wide of input and out put volt ages range, and more st able and accu rate cu rrent limiting operation com pared to boo st converte rs operating wit h a conventi onal PWM schem e .The XR2204D to pology ha s also the benefits of providing very good load and line regu lations, and excellent load transient response.

UNDERVOLTAGE LOCKOUT (UVLO)

To avoid mis-operation of the device at low inp ut voltages an under volt age lockout is i ncluded that disables the device, if the input volt age falls below 2.2V

THERMAL SHUTDOWN

A thermal sh utdown is implemente d to prevent damages due to exce ssive h eat and po wer dissipation. T ypically the thermal shut down threshold i s 150℃ .When the thermal shutdown is triggered th e device st ops swit ching until the temperature falls belo w typically 136 ℃ .Then the device starts switching again.

APPLICATION INFORMATION

INDUCTOR SELECTION

In normal operation, the inductor maintains continuous current to the output. The inductor current has a ripple that is dependent on the inductance value. The high inductance reduces the ripple current.

Selected inductor by actual application:

Manufacturer	*Part Number*	*Inductance (uH)*	*DRC max (Ohms)*	*Dimensions L*W*H(mm3)*
Murata	LQH44PN	2.2	0.049	4*4*1.7
		3.3	0.065	
		4.7	0.08	
		10 0.16		
	LQH5BP	2.2	0.030	5*5*2
		3.3	0.044	
		4.7	0.058	
		10	0.106	
TDK	SPM6530T	2.2	0017	7.1*6.5*3
		3.3	0.027	
		4.7 0.036		
	VLP6045 LT	2.2	0.020	6*6*4.5
		3.3	0.025	
		4.7	0.029	
		10 0.055		
WURTH	744373 24022	2.2 0.061		4.4*4.05
	744777004 4	7	0.025	7.3*7.3*4.5

Table 1. Recommend Surface Mount Inductors

If output voltage is 5V ， you can use 2.2uH~ 4.7uH, If output voltage is 12V, 4.7uH~ 10uH is OK，

Normal application: Input 3.3V (3.6V or 4.2V) to Output 5V 9V 12V ;

Input 5V to Output 9V 12V

Notes: Please select inductor according to I in. The IL need to be 1.5~2*I in. For getting higher efficiency, need to use low DRC inductors.

INPUT CAPACITOR SELECTION

The input ca pacitor re duces input volt age rippl e to t he converter , low ESR cerami c ca pacitor is hig hly recommended. For most applications, A 22uF or t wo 10 uF ce ramic cap acitor is u sed. The input ca pacitor should be placed as close as possible to VIN and GND. If use typical ap plication circuit 2 for 5Vout，suggest to add one 1u F between Pin-IN and GND and make sure thi s ca pacitor clo se to Pin-IN 。Such a s M urata GRM21BR60J226\ GRM21BR60J106 or TDK C3216X5R1A226M\ C3216X5R1A106M

OUTPUT CAPACITOR SELECTION

A low ESR o utput capacitor is required in orde r to maintain low output voltage ripple. In the case of cera mic output ca pacitors, cap acitor ESR is very small and does not con tribute to the ripple, so a lower cap acitance value is a cceptable when ceramic capacitors are u sed. Two 22uF ceramic output capacitor is suitable for most applications. Such as GRM21BR60J226 or TDK C3216X5R1A226M

OUTPUT VOLTAGE PROGRAMMING

In the adjustable version, the output voltage is set by a resistive divider according to the following equation:

$$R_1 = R_2 \times \left(\frac{V_{OUT}}{1.24} - 1 \right)$$

Typically choose R2=10K and determine R1 from the following equation:

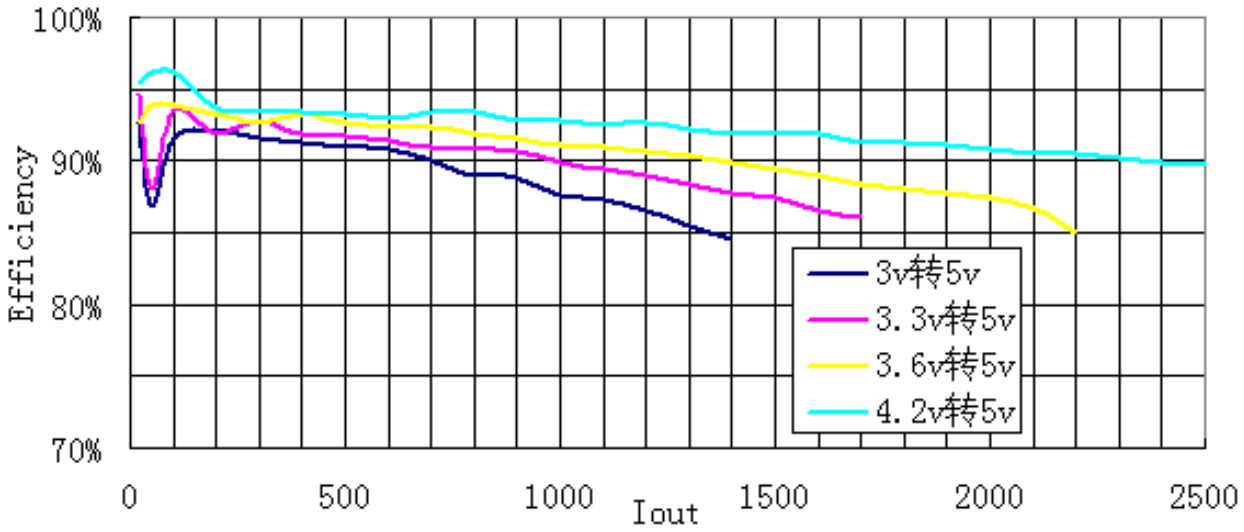
DIODE SELECTION

According to max Iout and m ax V out, you can sele ct su itable di ode. No rmally we sel ect diode If=(1.5~2)*Ioutmax and VR=(1.5 ~2)*Voutmax. For high ef ficiency，suggest that you sele ct low Vf Schottky diode.

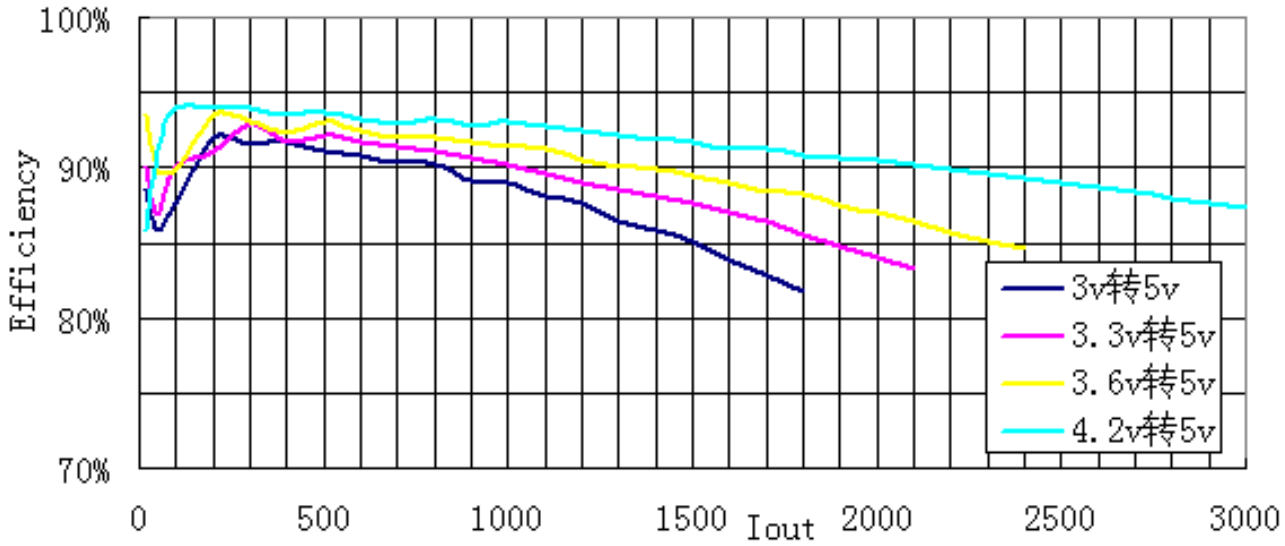
For example, 3.3V~4.2Vin 5V 1Aout, you can select MBRA210LT3 or SS34. 3.3V~4.2Vin 5V 2Aout，you can select MBRS410LT3 or SS34\SS54， Using MBRA210LT3 or MBRS410LT3, you can get higher efficiency.

TYPICAL PERFORMANCE CHARACTERISTICS

(L=2.2uH-SPM6530T2R2, CIN=22uF, COUT=22uFx2, D=MBRA210LT3 Vin=3.6V Vout=5V if not mentioned)



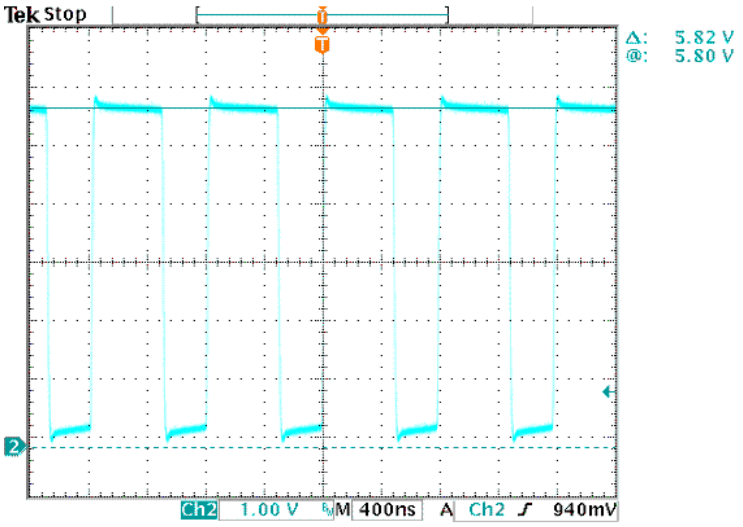
5VOUT (TYPICAL APPLICATION CIRCUIT1)



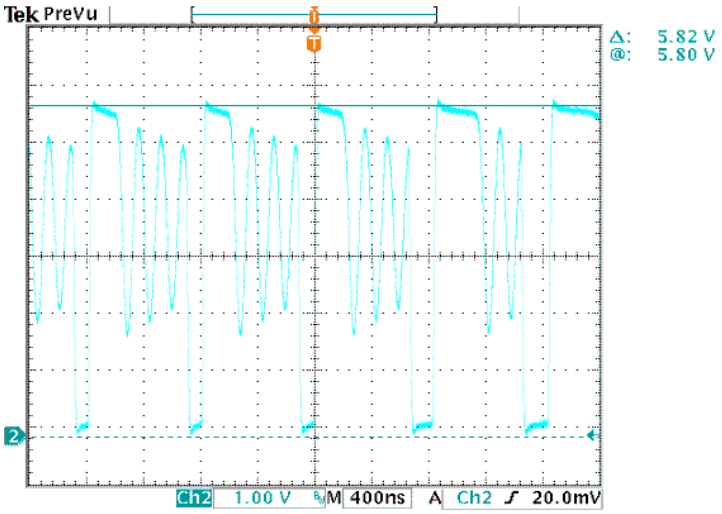
5VOUT (TYPICAL APPLICATION CIRCUIT2)

NOTES:

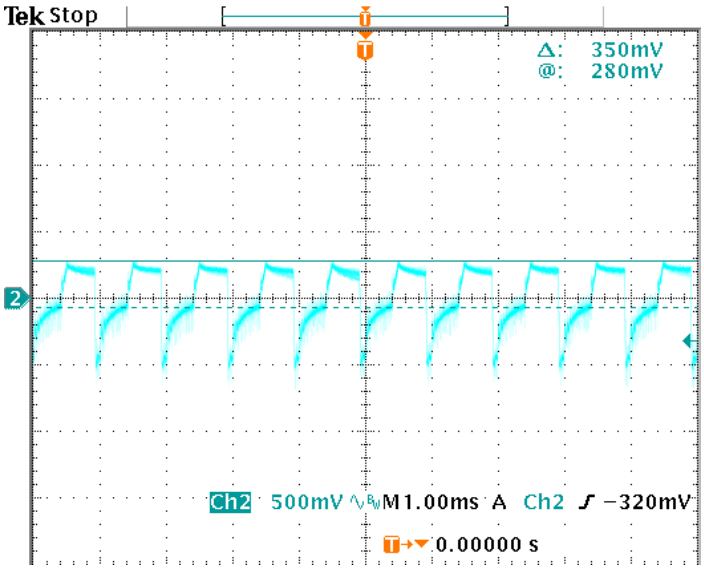
The efficiency is tested under normal temperature, the actual current driver capability is 70% ~90% of the max current in sheet consider of high temperature surrounding status



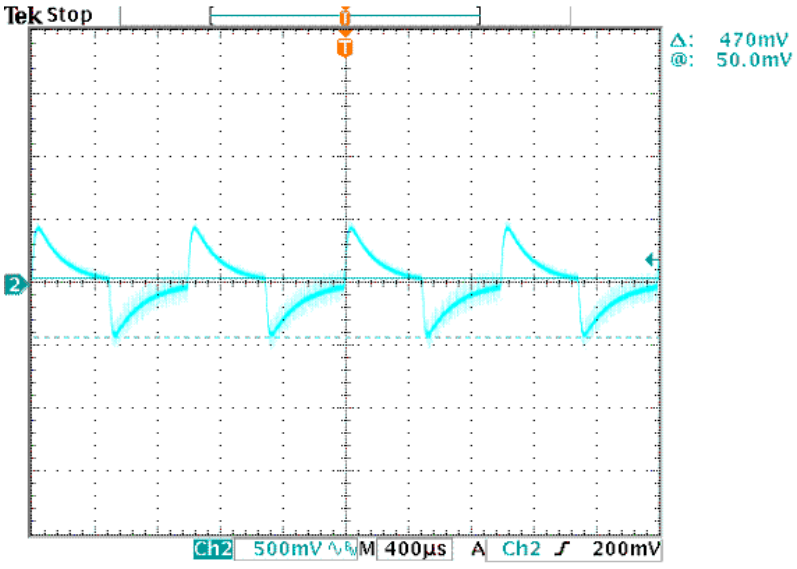
PWM SWITCHING CONTINUOUS CONDUCTION MODE



PWM SWITCHING DISCONTINUOUS CONDUCTION MODE



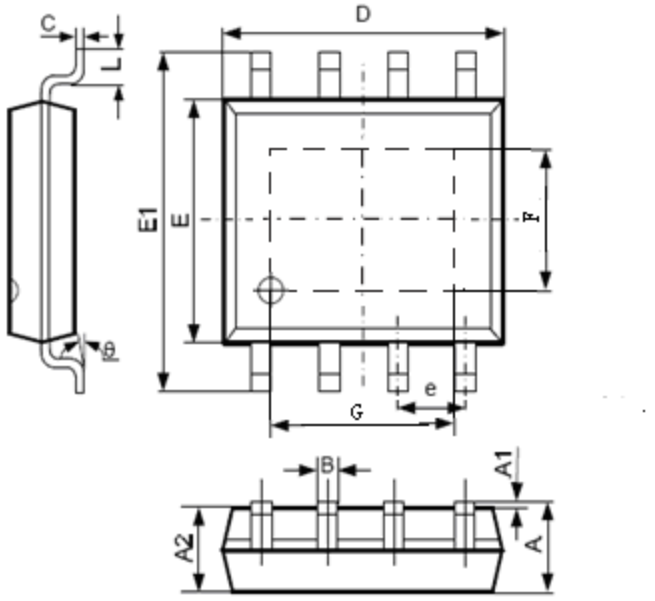
LOAD TRANSIENT WAVE(5VOUT 0A~1A)



LOAD TRANSIENT WAVE(5VOUT 0.2A~1A)

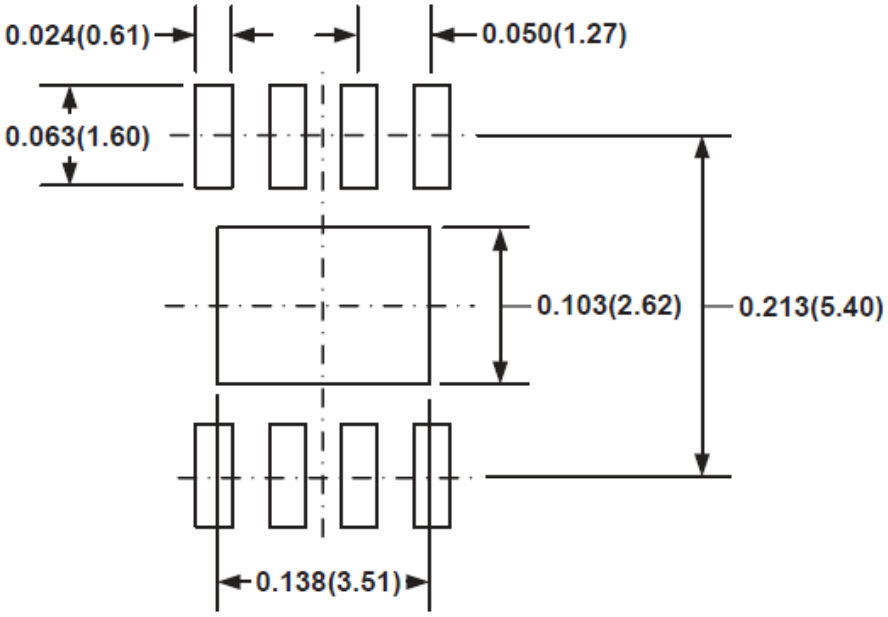
PACKAGE OUTLINE

SOP8-PP PACKAGE OUTLINE AND DIMENSIONS



SYMBOL	Dimension in Millimeters		Dimension in Inches	
	MIN	MAX	MIN	MAX
A	1.35	1.75	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
B	0.330	0.510	0.013	0.020
C	0.190	0.250	0.007	0.010
D	4.700	5.100	0.185	0.201
E	3.800	4.000	0.150	0.157
E1	5.800	6.300	0.228	0.248
e	1.27 TYP		0.050 TYP	
L	0.400	1.270	0.016	0.050
θ	0^o	8^o	0^o	8^o
F	2.26	2.56	0.089	0.101
G	3.15	3.45	0.124	0.136

In order to increase the driver current capability of XR2204 and improve the temperature of package, Please ensure Epad and enough ground PCB to release energy.



PROUCT CHANGE NOTICE LIST

NO	Updated date	Version update	Update content
1	2012-8-22	Rev 0.1	Create datasheet
2	2012-10-24	Rev 0.2	Add capacity selection
3	2012-11-30	Rev 0.3	Update Electrical Characteristics