1.5MHz, 1.5A Step-down Converter With Soft-Start

General Description

The LP6302 contains two independent 1.5MHz constant frequency, current mode, PWM step-down converters. The converter integrates a main switch and a synchronous rectifier for high efficiency without an external Schottky diode. The LP6302 is ideal for powering portable equipment that runs from a single cell Lithium-Ion (Li+) battery. The converter can supply 1200mA of load current from a 2.5V to 5.5V input voltage. The output voltage can be regulated as low as 0.6V. The LP6302 can also run at 100% duty cycle for low dropout applications.

The LP6302 is available in a 16-lead 3mm*3mm TDFN package and is rated over the -40°C to 85°C temperature range.

Order Information

LP6302 - □ □ □ □

F: Pb-Free
Package Type
QV: TDFN-12

Type: Vout1/Vout2
B: 1.8V/1.2V
C: 3.3V/1.2V
D: 3.3V/1.8V
A: Adjustable

Applications

- Portable Media Players
- Cellular and Smart mobile phone
- PDA/DSC
- GPS Applications

Marking Information

Please see website.

Features

- Input Voltage Range: 2.5V to 5.5V
- Output Voltage Range: 0.6V to VIN
- 1200mA Load Current on Each Channel
- Up to 95% Efficiency
- 100% Duty Cycle in Dropout
- < 1 u A Quiescent Current
- 1.5MHz Switching Frequency
- Soft star Function
- Short Circuit Protection
- Current Mode Operation
- Thermal Fault Protection
- 3 m m × 3 m m TDFN-12 Package
- RoHS Compliant and 100% Lead (Pb)-Free

Typical Application Circuit

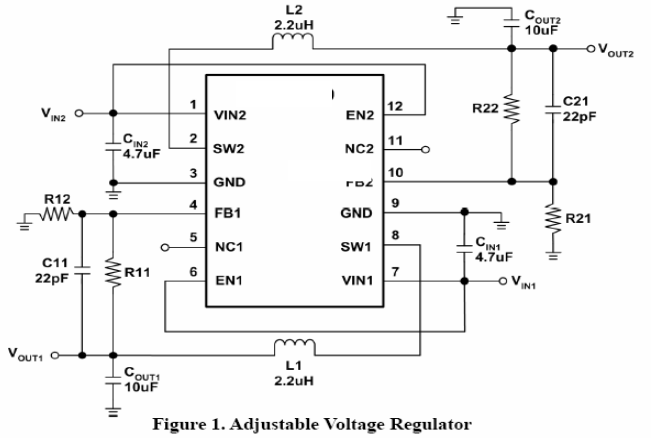


Figure 1. Adjustable Voltage Regulator

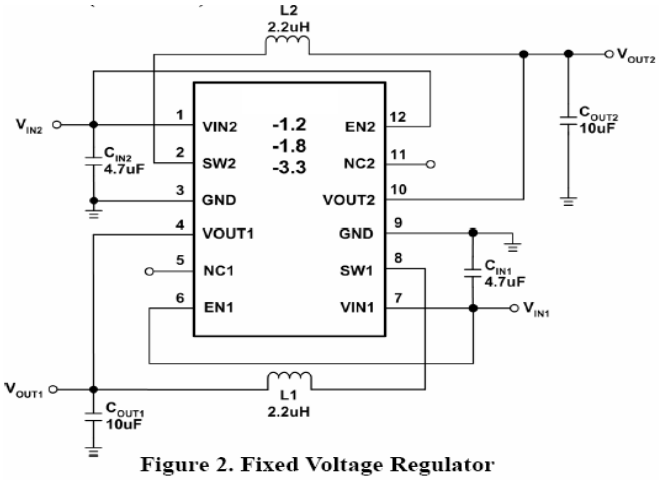
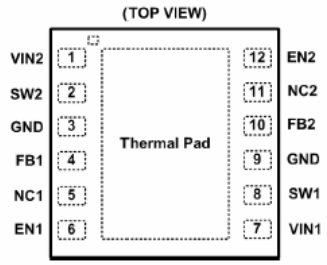
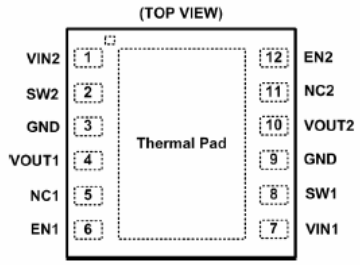


Figure 2. Fixed Voltage Regulator

Functional Pin Description

Package Type	Pin Configurations	Package Type	Pin Configurations
TDFN-12 ADJ Voltage		TDFN-12 Fixed Voltage	

Pin Description

Pin NO	PIN	DESCRIPTION
VIN2	1	Power Input of Channel 2.
SW2	2	Pin for Switching of Channel 2.
GND	3,9	Ground.
FB1/VOUT1	4	Feedback/Output Voltage Pin of Channel 1.
NC1,NC2	5,11	No Connection or Connect to VIN.
VIN2	1	Power Input of Channel 2.
EN1	6	Chip Enable of Channel 1 (Active High).VEN1 ≤ VIN1.
VIN1	7	Power Input of Channel 1.
SW1	8	Pin for Switching of Channel1.
FB2/VOUT2	10	Feedback/Output Voltage Pin of Channel 2.
EN2	12	Chip Enable of Channel 2 (Active High).VEN2 ≤ VIN2.

Function Block Diagram

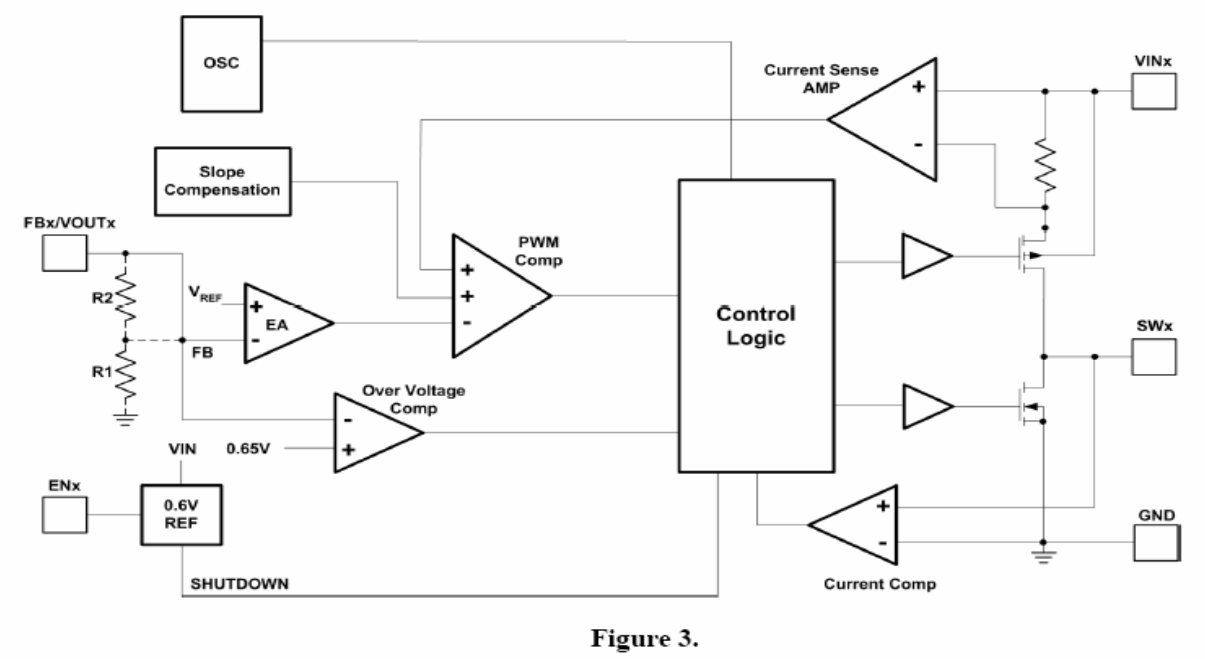


Figure 3.

Absolute Maximum Ratings

- ✧ Input Voltage to GND ---------- 6V
- ✧ SW to GND (V_{SW}) ---------- 0.3V to V_{IN} +0.3V
- ✧ FB to GND (V_{FB}) ---------- 0.3V to V_{IN} +0.3V
- ✧ EN EN_BAT to GND (V_{EN}) ----------0.3V to 6V
- ✧ Operating Junction Temperature Range (T_J) ----------40℃ to 150℃
- ✧ Maximum Soldering Temperature (at leads, 1 0sec) ----------260℃

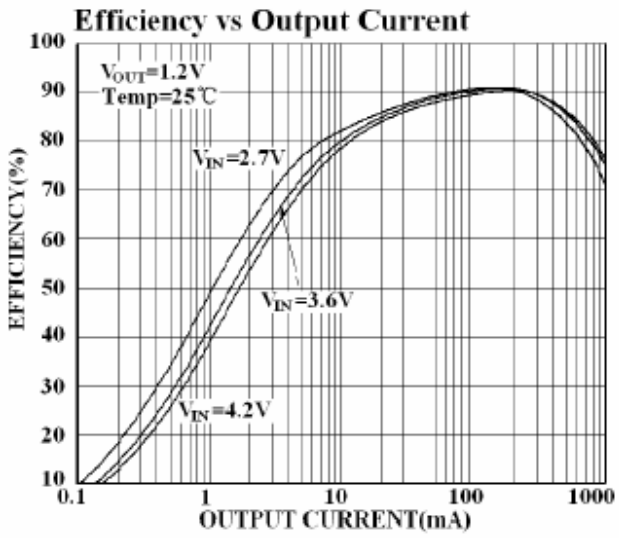
Electrical Characteristics

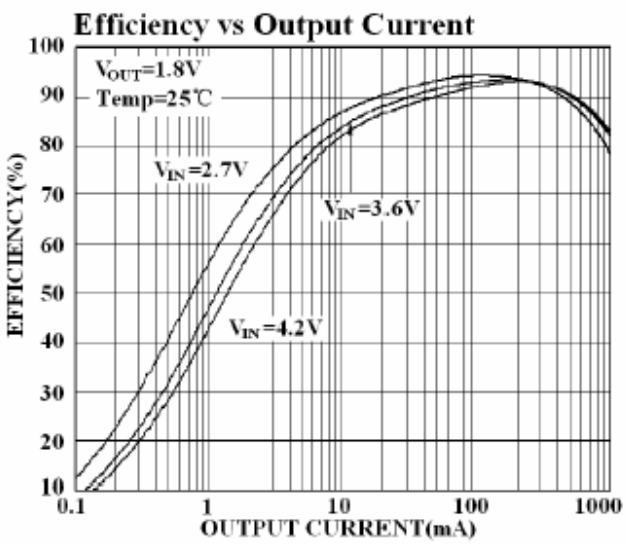
(V_{IN} =V_{EN},Typical values are T_A=25℃)

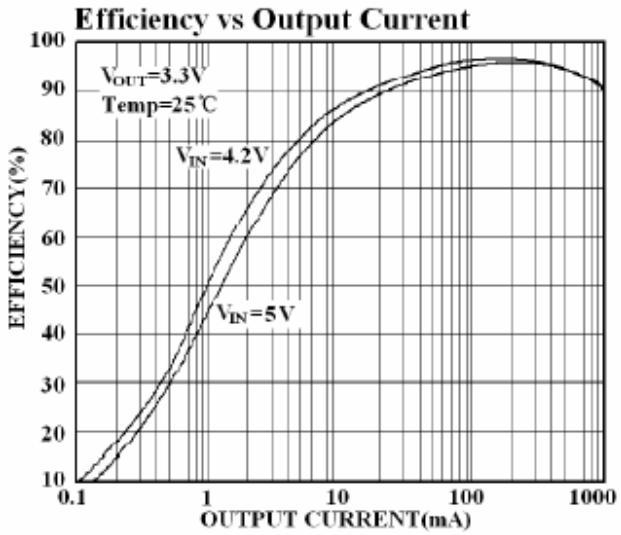
Symbol	Parameter	Conditions	LP6302			Unit
			Min.	Typ.	Max.	
Step-Down Converter						
V_{IN}	Input Voltage		2.5		5.5	V
△V_{OUT}	Output Voltage Line Regulation	I_{LOAD} = 0 V_{INB} = 2.5V to 5.5V		0.25	0.4	%/V
△V_{FB}	Reference Voltage Line Regulation	V_{INB} = 2.5V to 5.5V		0.25	0.4	%/V
V_{OUT}	Output Voltage Range		0.6		V_{INB}	V
I_Q	Quiescent Current	V_{FB1}=V_{FB2}=0V,$V_{IN1/IN2}$=4.2V		270	350	μA
I_{SHDN}	Shutdown Current	ENB = GND			1	μA
I_{LIM}	P-Channel Current Limit		1.6	1.8	2	A
$R_{DS(ON)H}$	High-Side Switch On Resistance			0.28	0.4	Ω
$R_{DS(ON)L}$	Low-Side Switch On Resistance			0.3	0.4	Ω
I_{LXLEAK}	LX Leakage Current	$V_{EN1/EN2}$=0V, $V_{SW1/SW2}$=0 or 5V, $V_{IN1/IN2}$=5V			1	μA
$\Delta V_{Line-reg}/\Delta V_{IN}$	Line Regulation	V_{INB} = 2.8V to 5.5V		0.2	0.4	%/V
V_{FB}	Feedback Threshold Voltage Accuracy	V_{INB} = 3.6V	0.588	0.6	0.612	V
I_{FB}	FB Leakage Current	V_{OUTB} = 1 .0V		30		nA
F_{OSC}	Oscillator Frequency	V_{FB1}=V_{FB2}=0.6V	1.2	1.5	1.8	MHz
		V_{FB1}=V_{FB2}=0V		0.7		
T_S	Startup Time	From Enable to Output Regulation		120		μs
T_{SD}	Over-Temperature Shutdown Threshold			150		℃
T_{HYS}	Over-Temperature Shutdown Hysteresis			20		℃
$V_{EN(L)}$	Enable Threshold Low				0.4	V
$V_{EN(H)}$	Enable Threshold High		0.3	1.0	1.5	V
I_{EN}	Input Low Current	V_{INB} = V_{ENB} = 5.5V	-1		1	μA

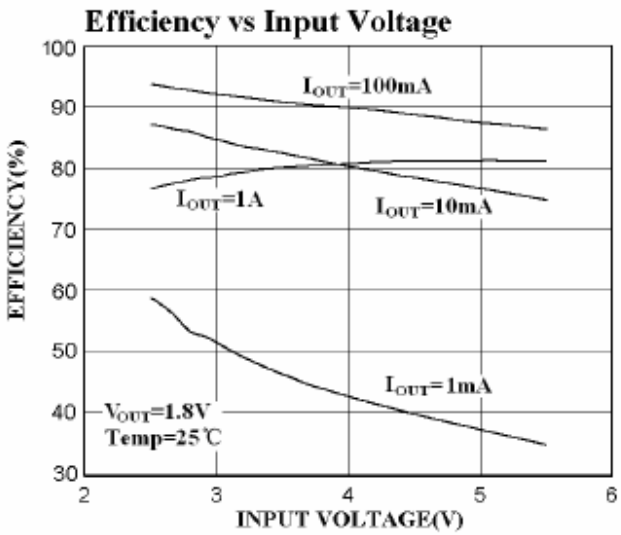
Note:
1.Output Voltage:
Vout1= (1+R11/R12) X V_{FB1}
Vout2= (1+R22/R21) X V_{FB2}

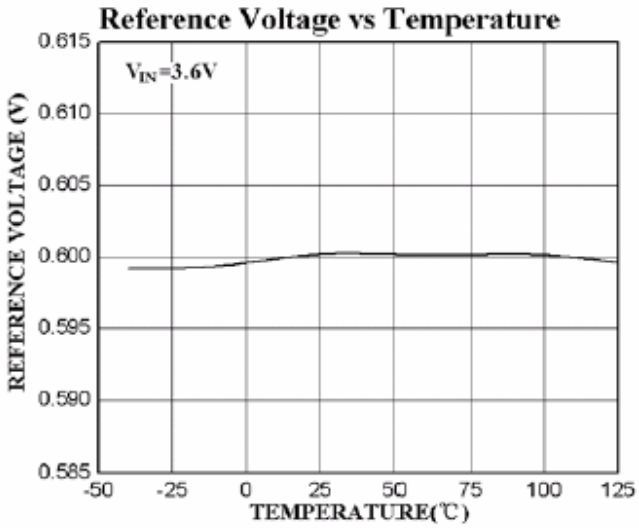
Typical Operating Characteristics

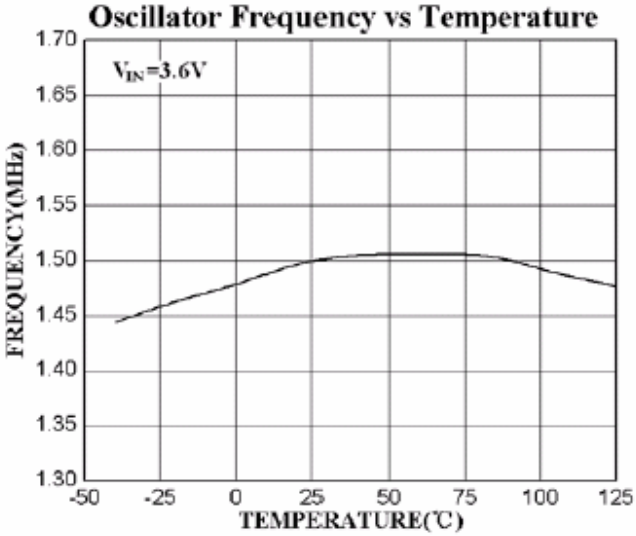


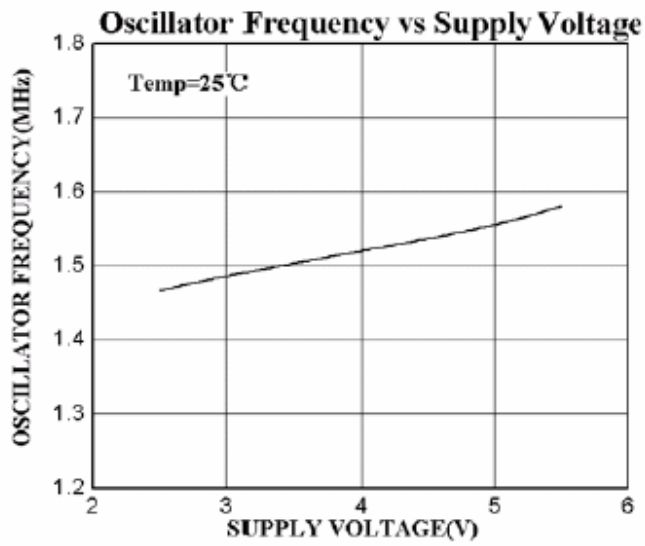


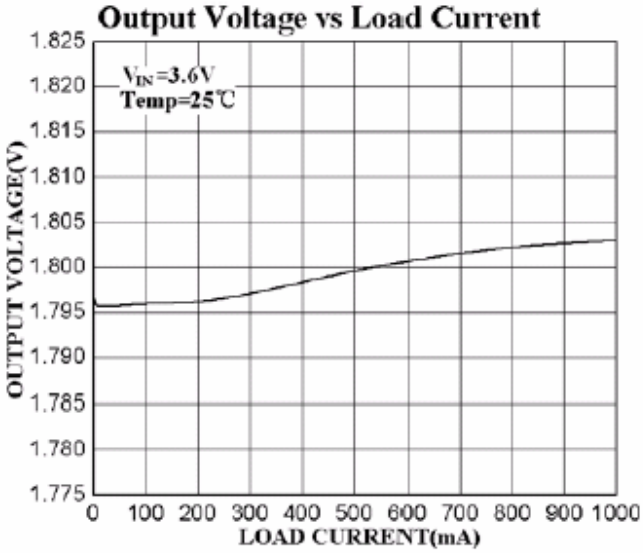


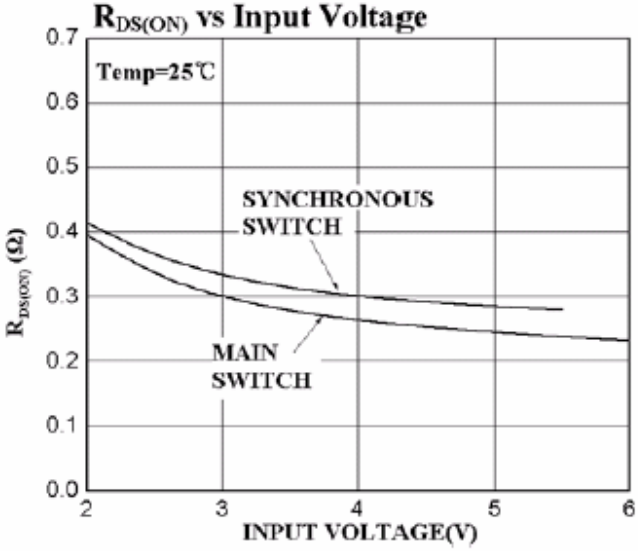


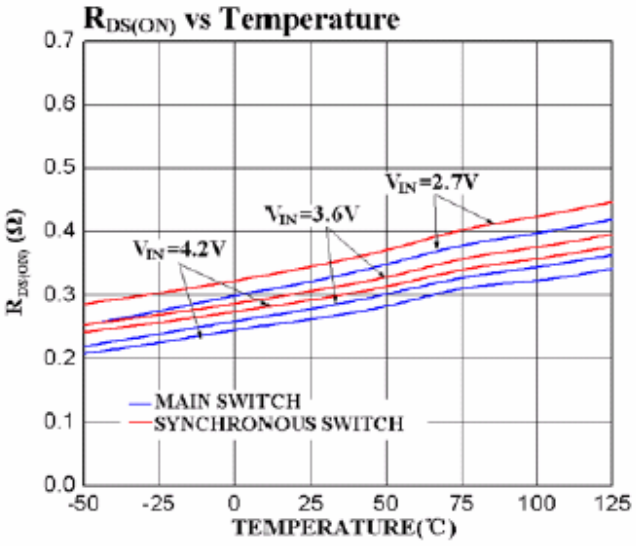


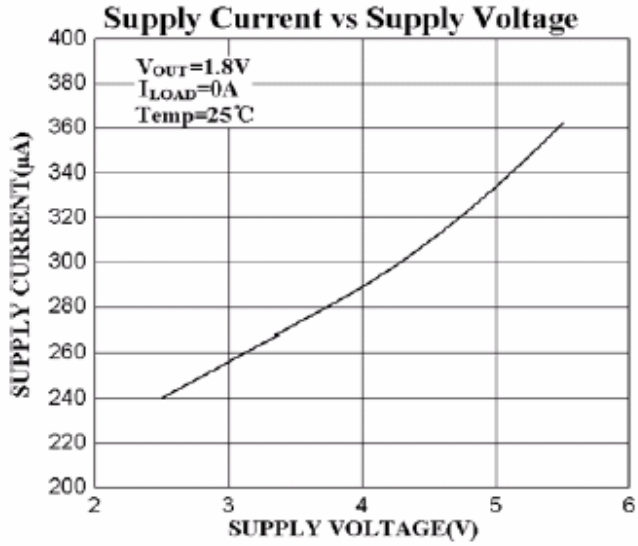


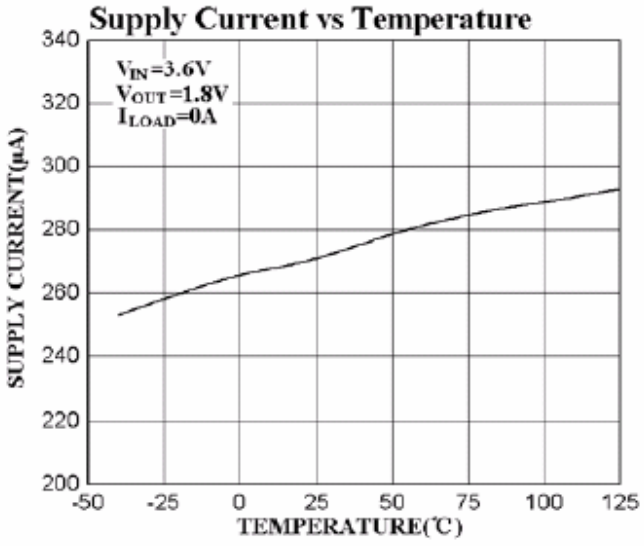

Oscillator Frequency vs Supply Voltage
Temp=25℃
OSCILLATOR FREQUENCY(MHz)
SUPPLY VOLTAGE(V)


Output Voltage vs Load Current
VIN=3.6V
Temp=25℃
OUTPUT VOLTAGE(V)
LOAD CURRENT(mA)

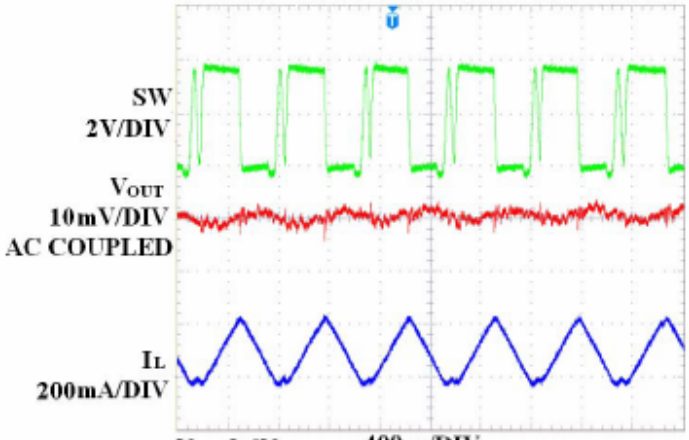

RDS(ON) vs Input Voltage
Temp=25℃
SYNCHRONOUS SWITCH
MAIN SWITCH
RDS(ON) (Ω)
INPUT VOLTAGE(V)


RDS(ON) vs Temperature
VIN=2.7V
VIN=3.6V
VIN=4.2V
MAIN SWITCH
SYNCHRONOUS SWITCH
RDS(ON) (Ω)
TEMPERATURE(℃)


Supply Current vs Supply Voltage
VOUT=1.8V
ILOAD=0A
Temp=25℃
SUPPLY CURRENT(μA)
SUPPLY VOLTAGE(V)

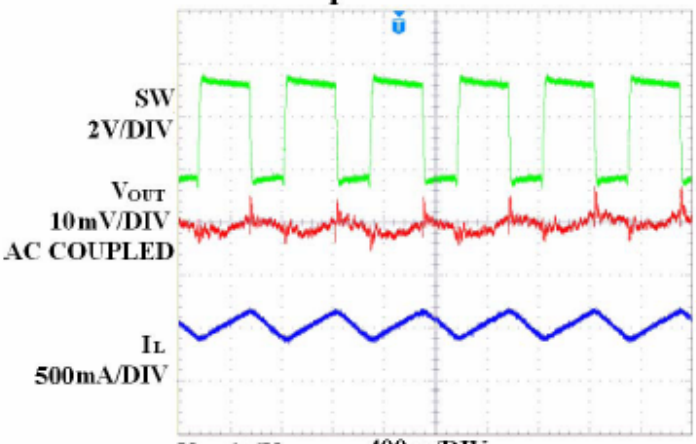

Supply Current vs Temperature
VIN=3.6V
VOUT=1.8V
ILOAD=0A
SUPPLY CURRENT(μA)
TEMPERATURE(℃)

Discontinuous Operation



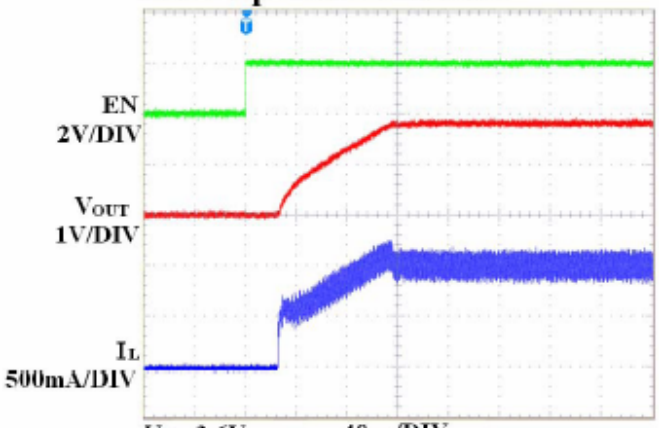
V_{IN}=3.6V 400ns/DIV
V_{OUT}=1.8V
I_{LOAD}=100mA

Normal Operation



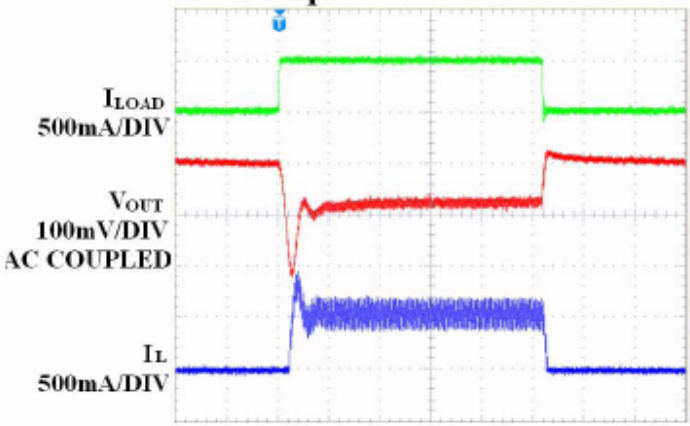
V_{IN}=3.6V 400ns/DIV
V_{OUT}=1.8V
I_{LOAD}=1A

Start-Up from Shutdown



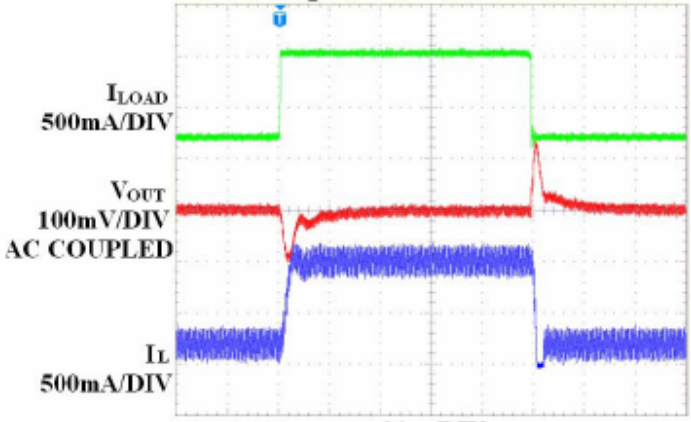
V_{IN}=3.6V 40µs/DIV
V_{OUT}=1.8V
I_{LOAD}=1A(LOAD:1.8Ω RESISTOR)

Load Step



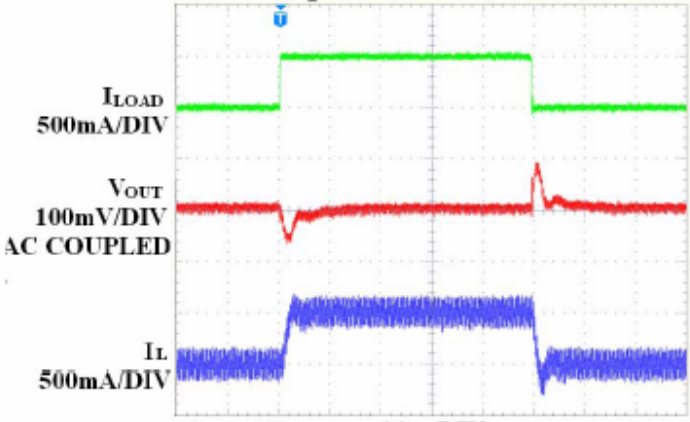
V_{IN}=3.6V 20µs/DIV
V_{OUT}=1.8V
I_{LOAD}=0mA TO 500mA

Load Step



V_{IN}=3.6V 20µs/DIV
V_{OUT}=1.8V
I_{LOAD}=200mA TO 1A

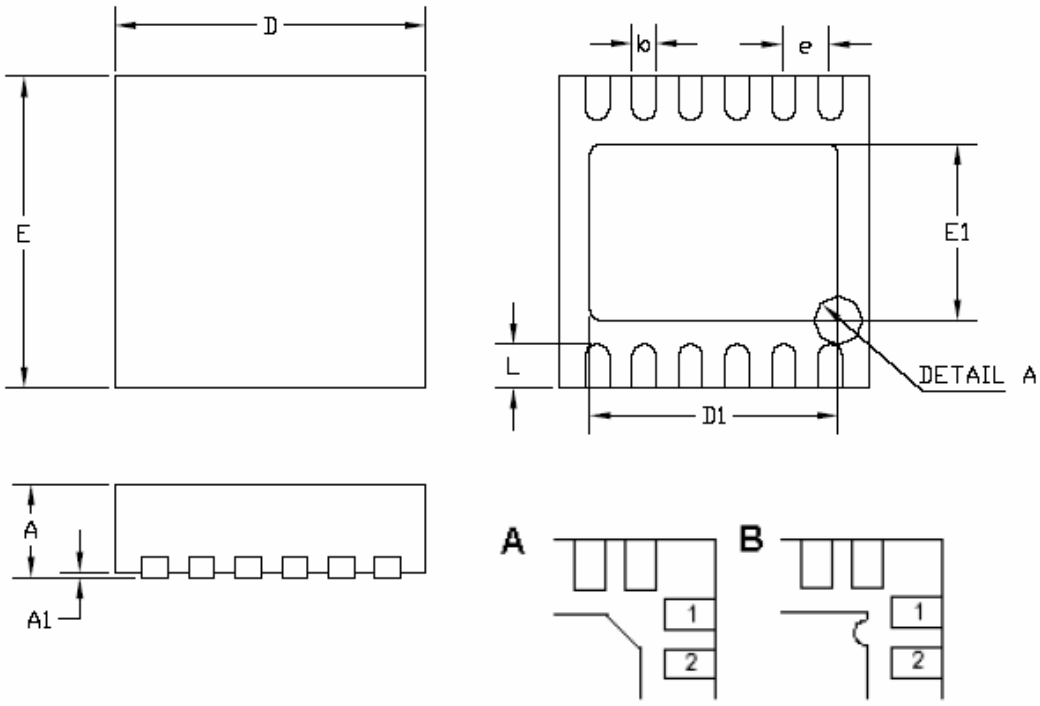
Load Step



V_{IN}=3.6V 20µs/DIV
V_{OUT}=1.8V
I_{LOAD}=500mA TO 1A

Packaging Information

TDFN-12



DETAIL A

Thermal Pad Option

SYMBOLS	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	0.70	0.80	0.028	0.031
A1	0.00	0.05	0.000	0.002
b	0.18	0.30	0.007	0.012
E	2.90	3.10	0.114	0.122
D	2.90	3.10	0.114	0.122
D1	2.40		0.094	
E1	1.70		0.067	
e	0.45		0.018	
L	0.30	0.50	0.012	0.020