

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

General Description

The LP6301 contains a 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 LP6301 is ideal for powering portable equipment that runs from a single cell Lithium-Ion (Li+) battery. The converter can supply 1500mA of load current from a 2.5V to 5.5V input voltage. The output voltage can be regulated as low as 0.6V. The LP6301 can also run at 100% duty cycle for low dropout applications.

The LP6301 is available in a 16-lead 2mm*2mm DFN package and is rated over the -40°C to 85°C temperature range.

Order Information

LP6301 -	□	□	□	□	□	□	F: Pb-Free
							Package Type
							QV: TDFN-6
							12: 1.2V
							18: 1.8V
							33: 3.3V
							A: Adjustable

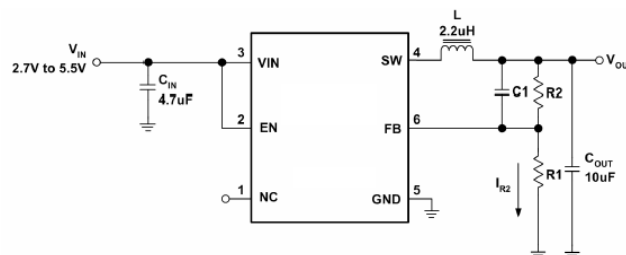
Applications

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

Features

- ✧ Input Voltage Range: 2.5V to 5.5V
- ✧ Output Voltage Range: 0.6V to VIN
- ✧ 1500mA Load Current on Each Channel
- ✧ Up to 95% Efficiency
- ✧ 100% Duty Cycle in Dropout
- ✧ < 1 uA Quiescent Current
- ✧ 1.5MHz Switching Frequency
- ✧ Soft star Function
- ✧ Short Circuit Protection
- ✧ Current Mode Operation
- ✧ Thermal Fault Protection
- ✧ 2 mm × 2 mm TDFN-6 Package
- ✧ RoHS Compliant and 100% Lead (Pb)-Free

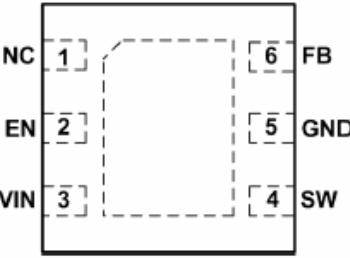
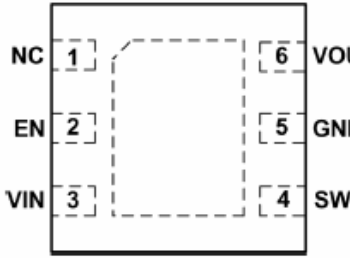
Typical Application Circuit



Marking Information

Please see website.

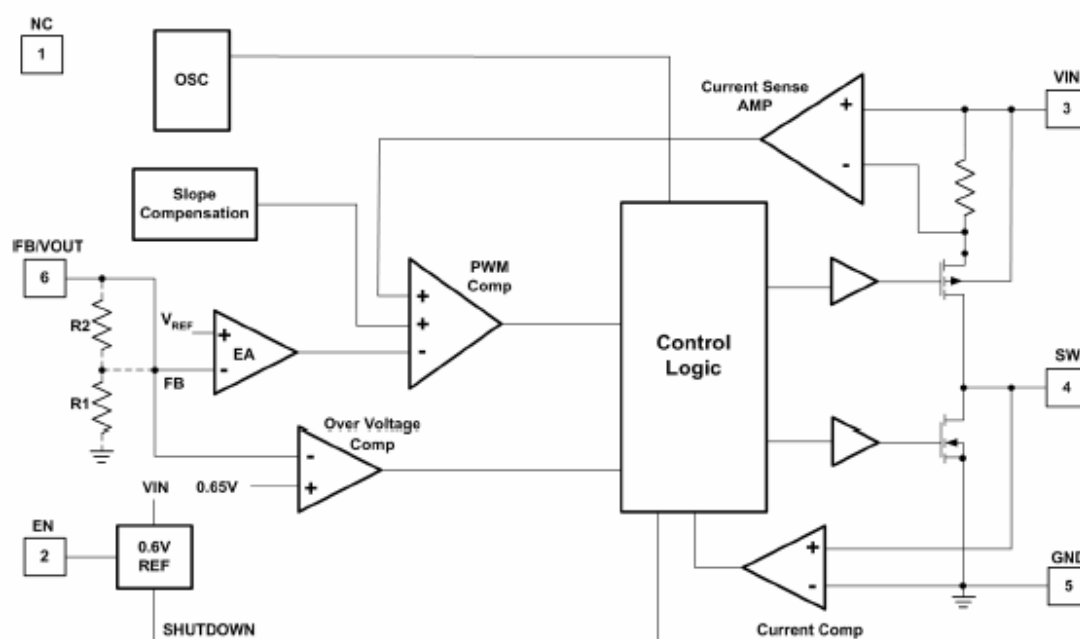
Functional Pin Description

Package Type	Pin Configurations	Package Type	Pin Configurations
TDFN-6 ADJ Voltage		TDFN-6 Fixed Voltage	

Pin Description

Pin NO	PIN	DESCRIPTION
1	NC	No Connect.
2	EN	Enable Control Input. Drive EN1 above 1.5V to turn on the Channel. Drive EN below 0.3V to turn it off (shutdown current < 0.1μA).
3	Vin	Supply Input.
4	SW	Switch Mode Connection to Inductor. This pin connects to the drains of the internal main and synchronous power MOSFET switches.
5	GND1	Ground 1.
6	FB	Feedback Input. Connect FB to the center point of the external resistor divider. Normal voltage for this pin is 0.6V.

Function Block Diagram



Absolute Maximum Ratings

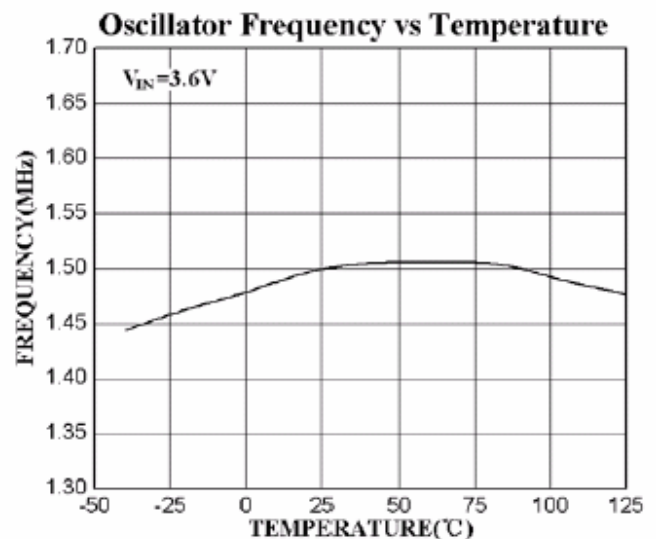
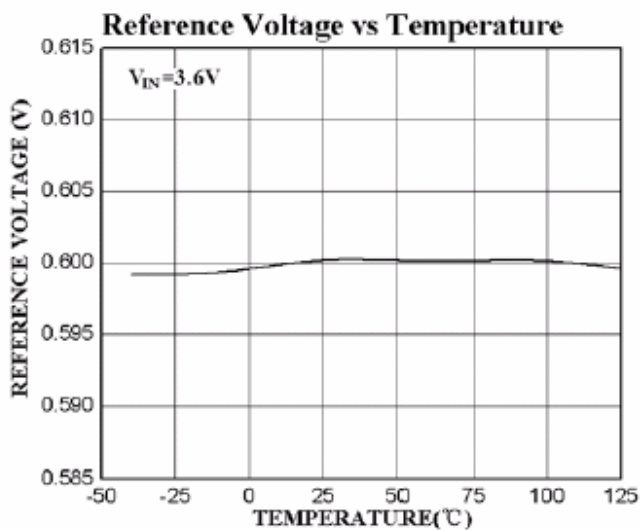
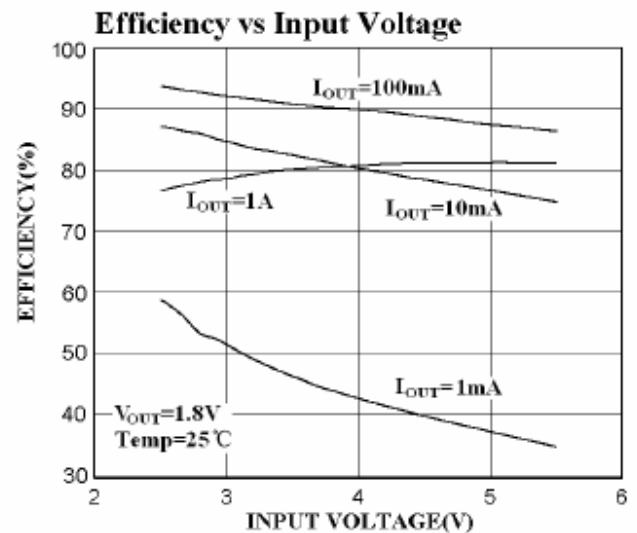
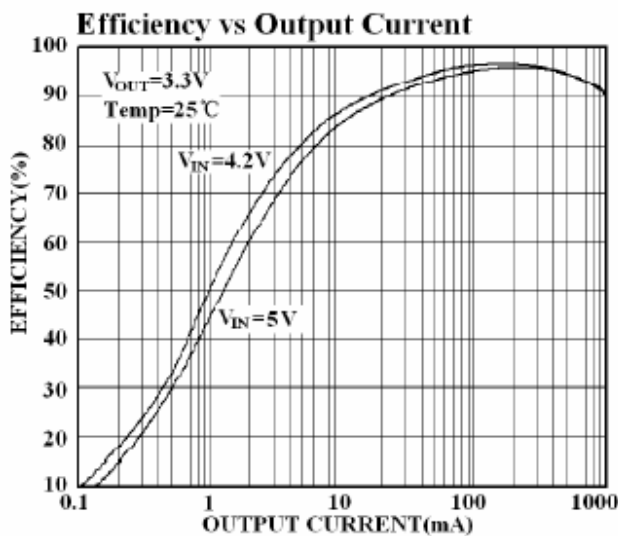
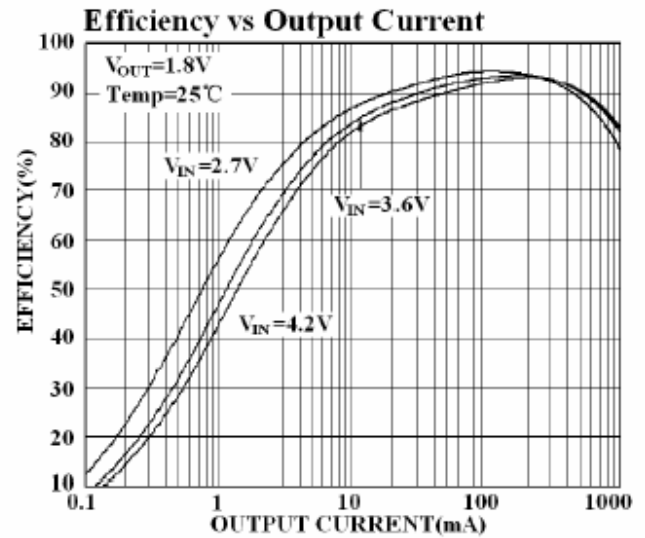
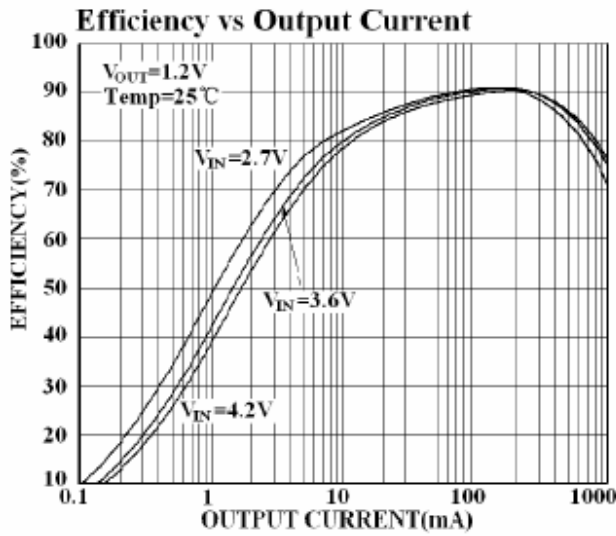
- ✧ Input Voltage to GND ----- 6V
- ✧ SW to GND (V_{SW}) ----- 0.3V to $V_{IN} + 0.3V$
- ✧ FB to GND (V_{FB}) ----- 0.3V to $V_{IN} + 0.3V$
- ✧ EN EN_BAT to GND (V_{EN}) ----- 0.3V to 6V
- ✧ Operating Junction Temperature Range (T_J) ----- 40°C to 150°C
- ✧ Maximum Soldering Temperature (at leads, 1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

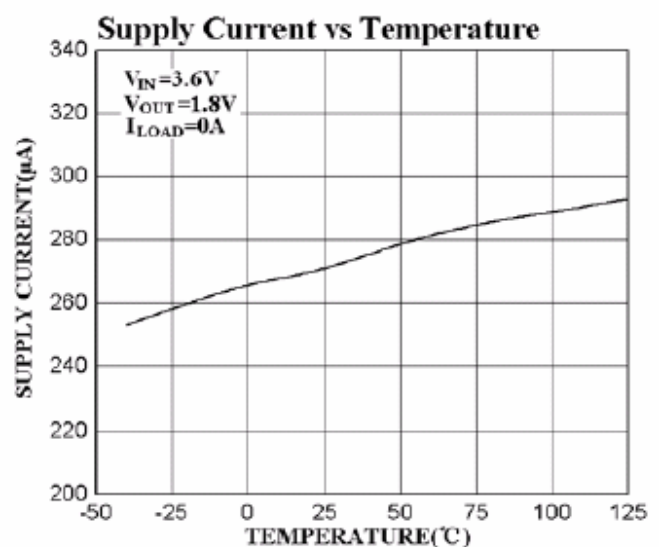
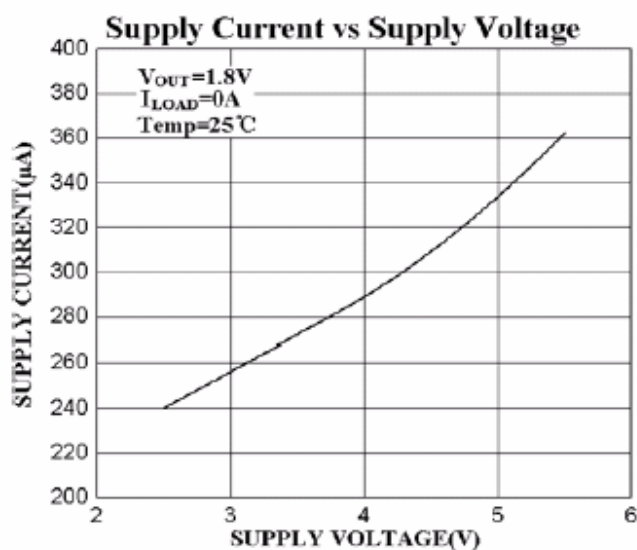
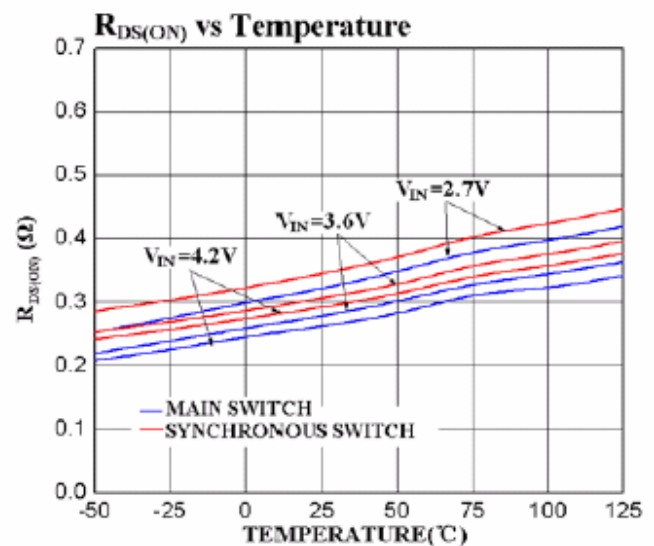
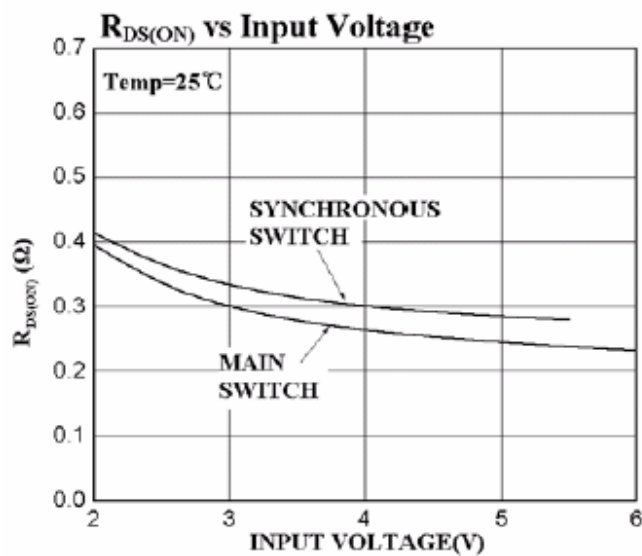
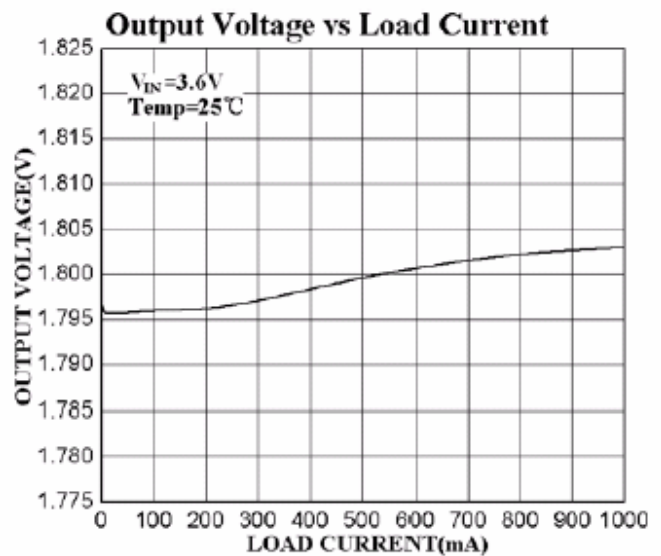
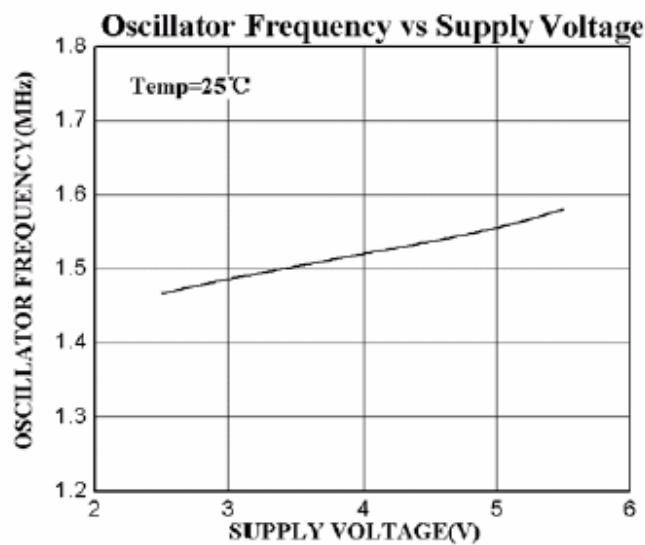
Electrical Characteristics

($V_{IN} = V_{EN}$, Typical values are $T_A = 25^\circ\text{C}$)

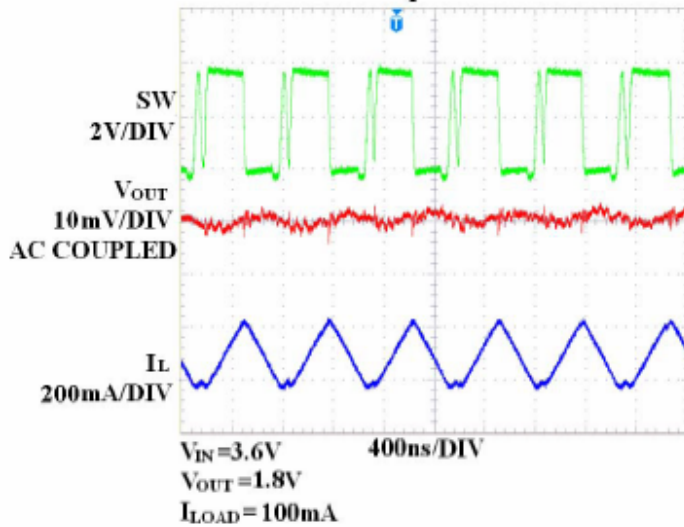
Symbol	Parameter	Conditions		LP6301		Unit
			Min.	Typ.	Max.	
Step-Down Converter						
V _{IN}	Input Voltage		2.5		5.5	V
△V _{OUT}	Output Voltage Line Regulation	I _{LOAD} = 0 V _{INB} = 2.5V to 5.5V		0.25	0.4	%/V
△V _{FB}	Reference Voltage Line Regulation	V _{INB} = 2.5V to 5.5V		0.25	0.4	%/V
V _{OUT}	Output Voltage Range		0.6		V _{INB}	V
I _Q	Quiescent Current	V _{FB1} =V _{FB2} =0V,V _{IN1} /I _{N2} =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} /EN ₂ =0V, V _{SW1} /SW ₂ =0 or 5V, V _{IN1} /I _{N2} =5V			1	μA
ΔV _{Line-reg} /ΔV _{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 _{THYS}	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

Typical Operating Characteristics

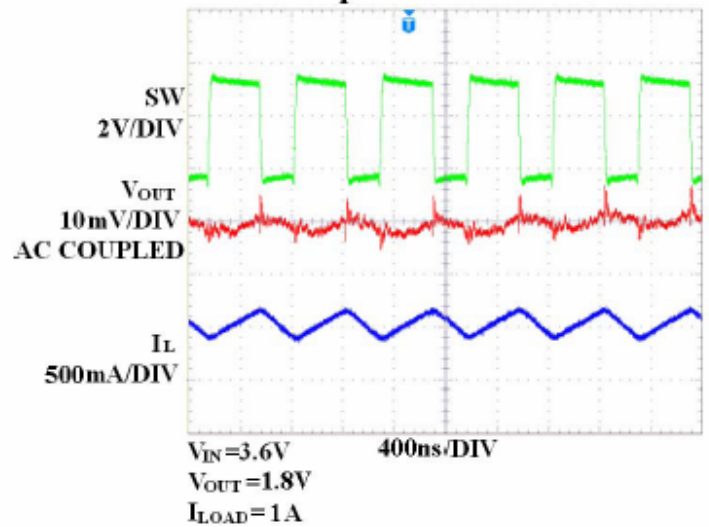




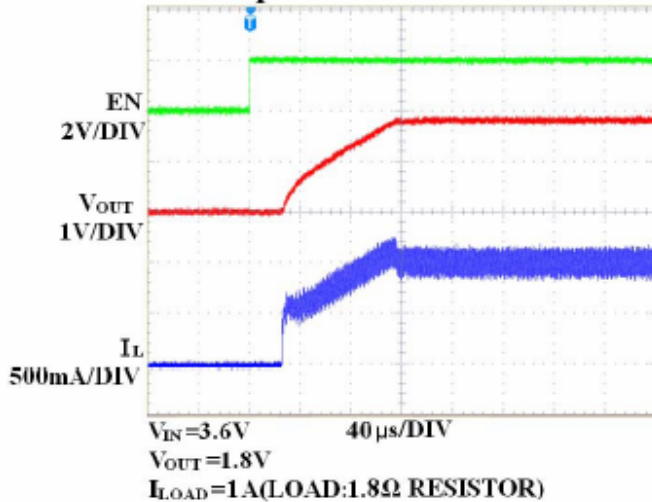
Discontinuous Operation



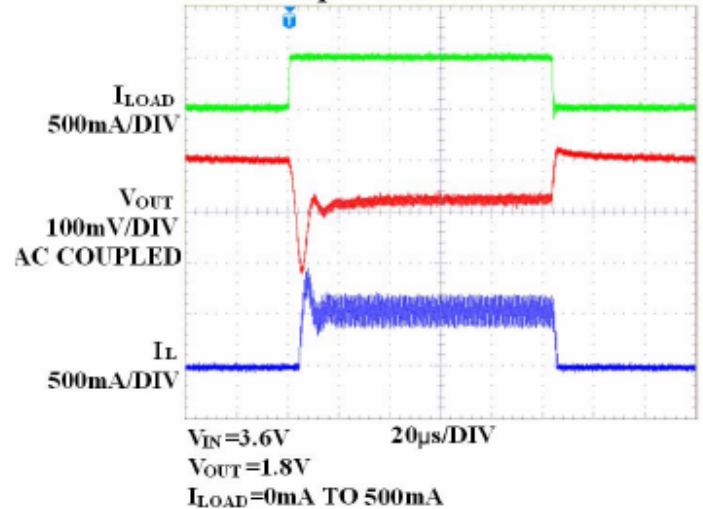
Normal Operation



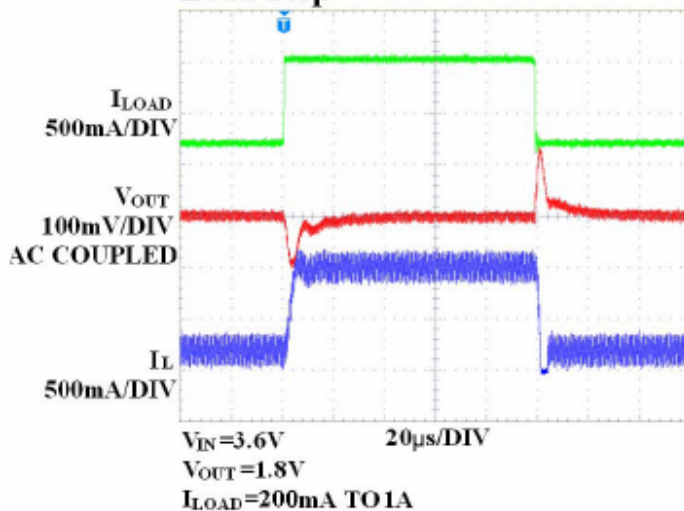
Start-Up from Shutdown



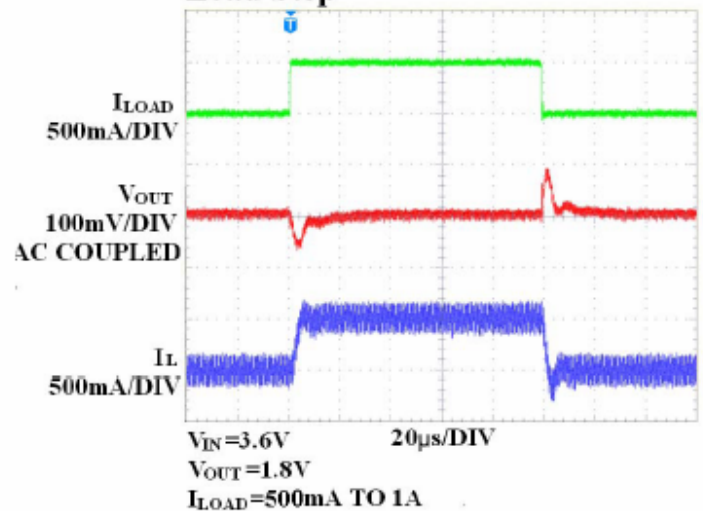
Load Step



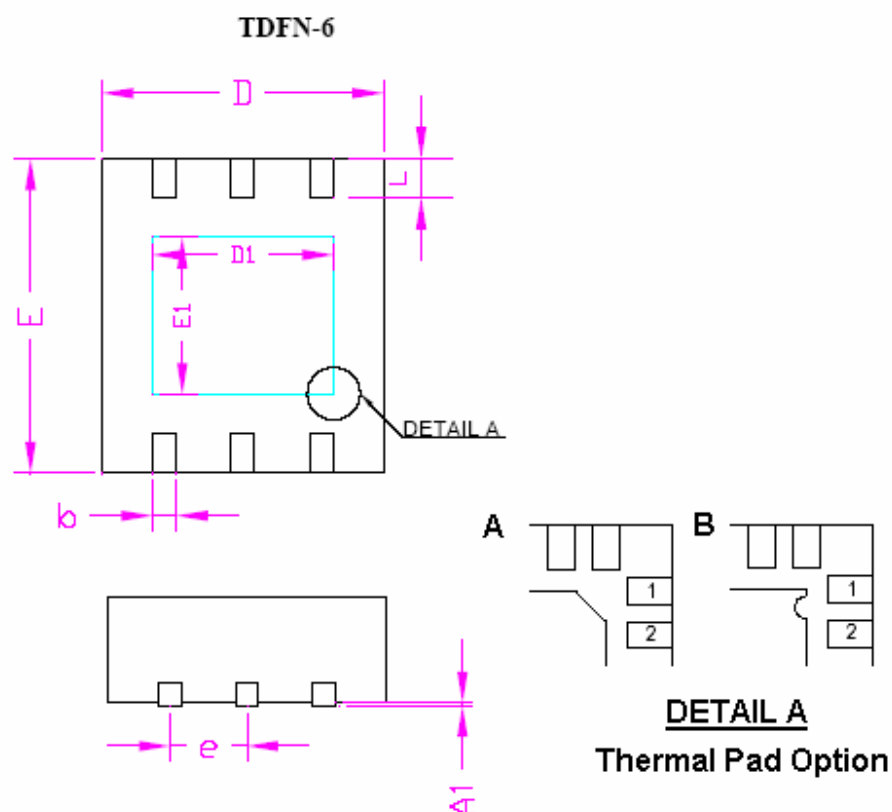
Load Step



Load Step



Packaging Information



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	0.20	0.40	0.008	0.016
D	1.90	2.10	0.075	0.083
D1	1.40		0.055	
E	1.90	2.10	0.075	0.083
E1	0.80		0.031	
e	0.65		0.026	
L	0.25	0.45	0.010	0.018