LOW-NOISE BOOST DC-DC CONVERTER

Description

The FP6790 is a step-up current mode PWM DC/DC converter with an internal 1.6A, 0.25Ω N-channel MOSFET. Pin selectable fixed switching frequency (1.2MHz or 640KHz) and external compensation pin provide the user flexibility in setting the loop dynamic, allowing the use of tiny, low profile inductors and low value, low ESR ceramic output capacitors.

The FP6790 provides soft-start feature which is programmable with an external capacitor. In shutdown mode, current consumption is reduced to only 0.1uA. The FP6790 converts the input voltage ranged from 2.6V to 5.5V into an output voltage up to 12V.

FP6790 is available in the space-saving MSOP-8 package.

Features

- Operating Voltage from 2.6V to 5.5V
- Output Voltage from Input Voltage to 12V
- 90% Efficiency
- 1.6A, 0.25Ω Internal Power MOSFET
- Pin Selectable Switching Frequency (1.2MHz or 640KHz)
- Programmed Soft Start
- External Compensation Network
- 0.1uA Shutdown Current
- MSOP-8 Package
- RoHS Compliant

Applications

- LCD Displays
- Portable Applications
- Hand-Held Devices
- Digital Cameras

Pin Assignments

MS Package (MSOP-8)

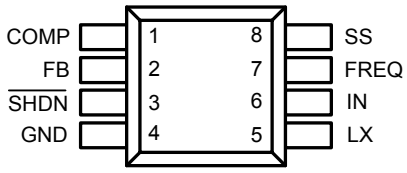
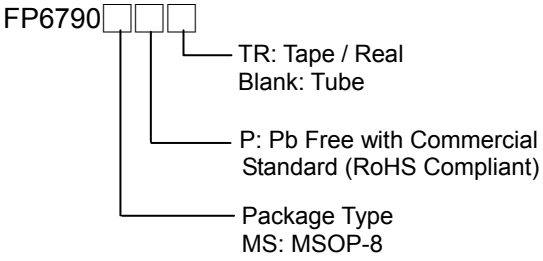


Figure 1. Pin Assignment of FP6790

Ordering Information



Typical Application Circuit

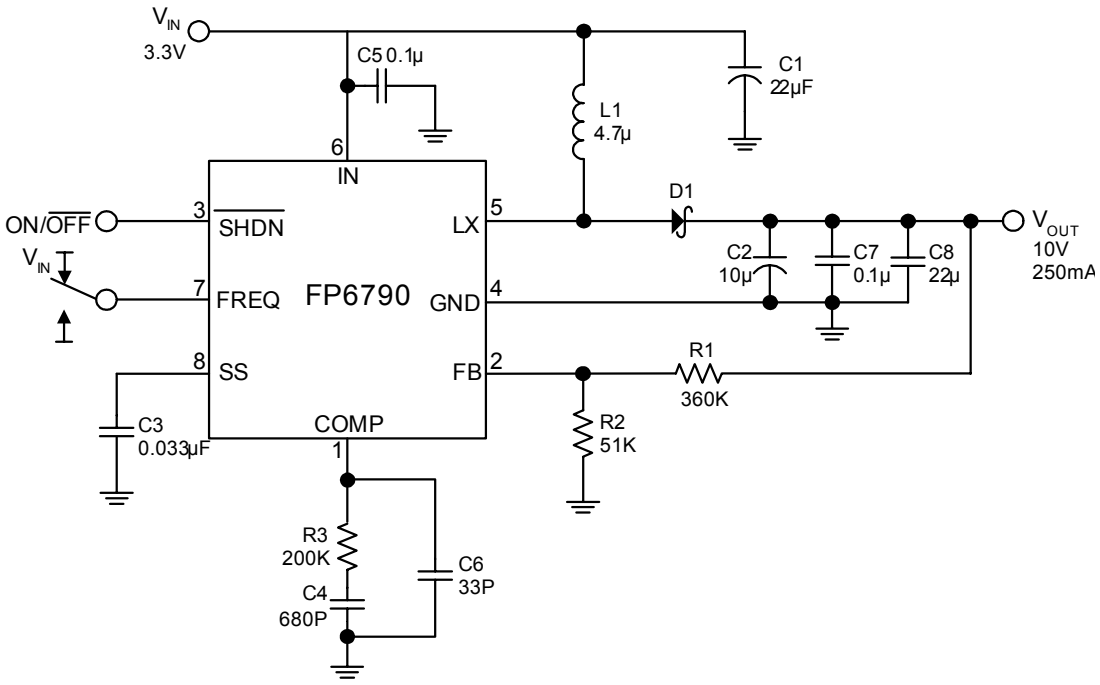


Figure 2. Typical Application Circuit of FP6790

V_{IN} (V)	V_{OUT} (V)	fOSC (KHz)	L (µH)	C_{OUT} (µF)	R3 (kΩ)	C4 (pF)	C6 (pF)	I_{OUT}(MAX) (mA)
3.3	10	640	10 (TDK SLF7045)	33 (Ceramic)	120	1000	47	250
3.3	10	1200	4.7 (TDK SLF7045)	33 (Ceramic)	200	680	33	250

Functional Pin Description

Pin Name	Pin Function
COMP	Compensation Pin for Error Amplifier. Connect a series RC from COMP to ground.
FB	Feedback Pin. The typical reference voltage is 1.24V. Set V_{OUT} = 1.24V (1+ R1/R2). See Figure 2.
$\overline{\text{SHDN}}$	Enable Pin. Connect **$\overline{\text{SHDN}}$** low to turn off FP6790.
GND	Ground.
LX	Switching Pin.
IN	Power Input Pin.
FREQ	Frequency Select Pin. When FREQ connected to ground, the frequency is 640KHz. When FREQ connected to V_{IN}, the frequency is 1.2MHz.
SS	Soft-Start Control Pin. Connect a capacitor (C3) to this pin. The pin will source 4uA constant current to charge the capacitor. Leaving floating for not using soft-start.

Block Diagram

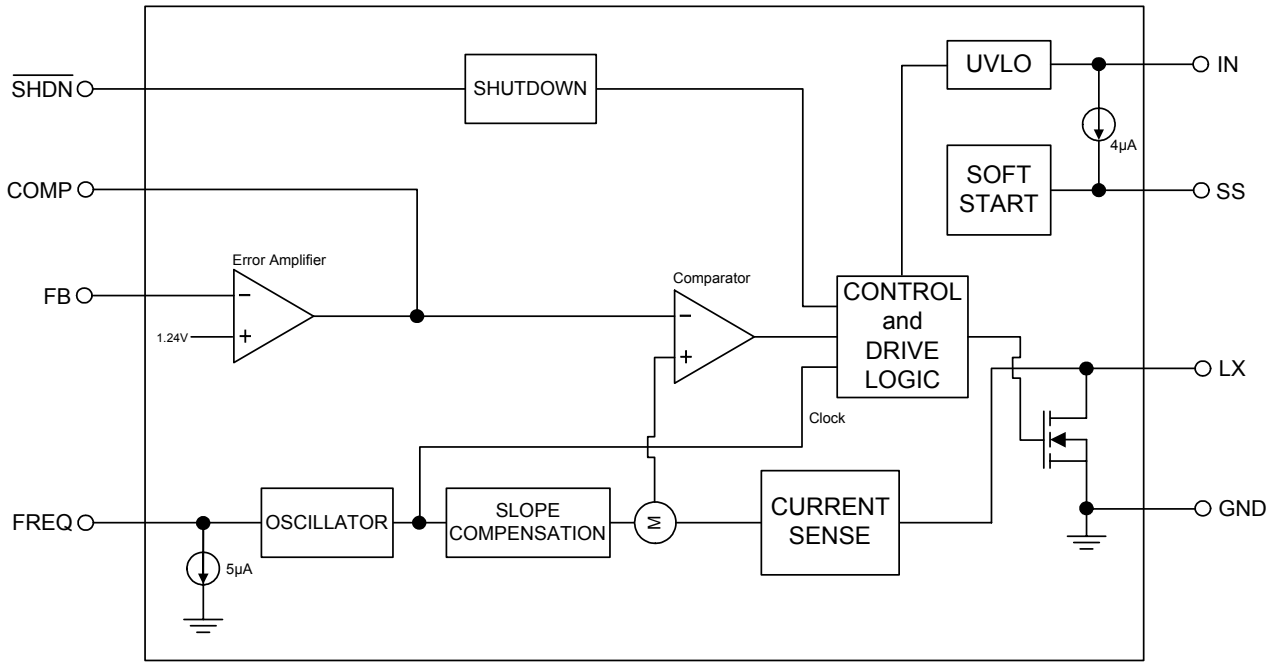


Figure 3. Block Diagram of FP6790

Absolute Maximum Ratings

- VIN to GND---------- -0.3V to +6V
- LX to GND---------- -0.3V to +14V
- SHDN, FB, SS, FREQ, COMP to GND---------- -0.3V to +6V
- Continuous Power Dissipation (T_A=+70°C) ---------- 330mW
- Junction Temperature---------- +150°C
- Storage Temperature Range---------- -65°C to +150°C
- Lead Temperature (Soldering, 10sec.) ---------- 260°C

Note：Stresses beyond those listed under “Absolute Maximum Ratings" may cause permanent damage to the device.

Recommended Operating Conditions

- Supply Voltage, V_{IN}---------- 3.3V±10%, 5V±10%
- Operation Temperature Range---------- -40°C to +85°C

Electrical Characteristics

(V_{IN}=3V, $\overline{SHDN}$=3V, FREQ=GND, T_A=25°C, unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
INPUT						
Operation Voltage Range	V_{IN}		2.6		5.5	V
V_{IN} Under Voltage Lockout	UVLO	V_{IN} rising, typical hysteresis is 100mV	2.25	2.38	2.52	V
Quiescent Current	I_{IN}	V_{FB}=1.3V, not switching		160	350	μA
		V_{FB}=1V, switching		0.8	5	mA
Shutdown Current	I_{SD}	$\overline{SHDN}$=0V		0.1	10	μA
ERROR AMPLIFIER						
Feedback Voltage	V_{FB}		1.222	1.24	1.258	V
FB Input Bias Current	I_{FB}	V_{FB}=1.24V			40	nA
Feedback Voltage Line Regulation		2.6V< V_{IN} <5.5V		0.08	0.3	%/V
Transconductance	gm	Δ_I =5μA	70	170	240	μS
Voltage Gain	A_V			700		V/V
OSCILLATOR						
Frequency	F_{OSC}	FREQ=GND	540	640	740	KHz
		FREQ=V_{IN}	1000	1200	1500	KHz
Maximum Duty Cycle	T_{DUTY}	FREQ=GND	79	85	92	%
		FREQ=V_{IN}		84		%
N-CHANNEL SWITCH						
Current Limit	I_{LIM}		1.2	1.6	2.3	A
On-Resistance	R_{ON}	I_{LX}= 200mA		0.25	0.5	Ω
Leakage Current	I_{LXOFF}	V_{LX}=12V		0.01	20	μA
SOFT-START						
Reset Switching Resistance					100	Ω
Charge Current	I_{SS}	V_{SS}=1.2V	1.5	4	7	μA
CONTROL INPUTS						
Input High Level	VIH	$\overline{SHDN}$,FREQ	0.7*V_{IN}			V
Input Low Level	VIL	$\overline{SHDN}$,FREQ			0.3*V_{IN}	V
Hysteresis		$\overline{SHDN}$,FREQ		0.1*V_{IN}		V
Frequency Pulldown Current	I_{FREQ}		1.8	5	9	μA
$\overline{SHDN}$ Input Current	$I_{\overline{SHDN}}$			0.001	1	μA
PROTECTION						
Thermal Shutdown	T_{SD}			140		°C
Thermal Shutdown Hysteresis	ΔT_{SD}			25		°C

Typical Performance Curves

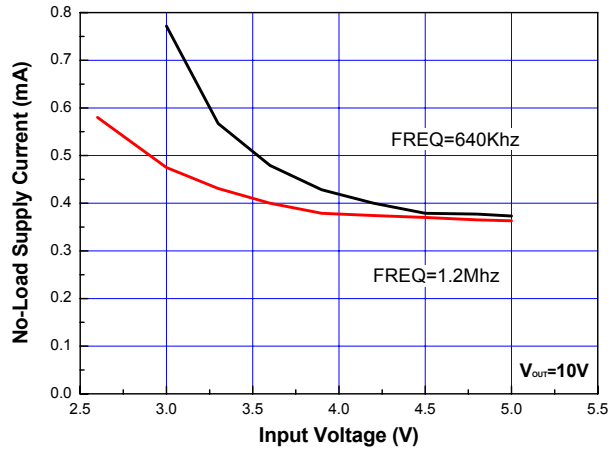


Figure 4. No-Load Supply Current vs. Input Voltage

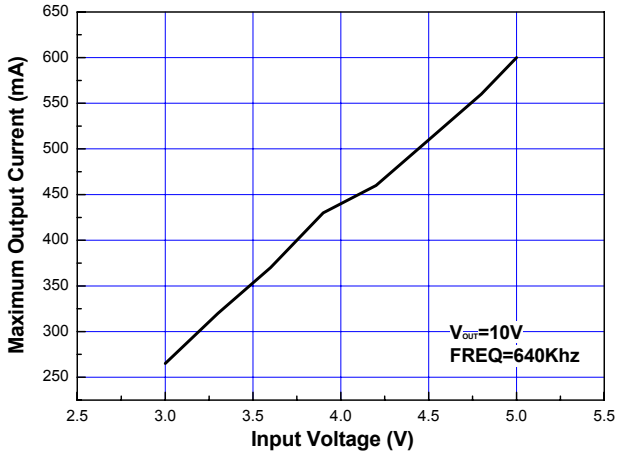


Figure 5. Maximum Output Current vs. Input Voltage

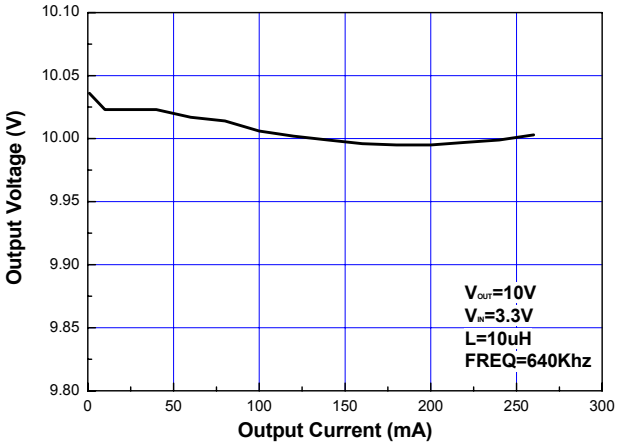


Figure 6. Output Voltage vs. Output Current

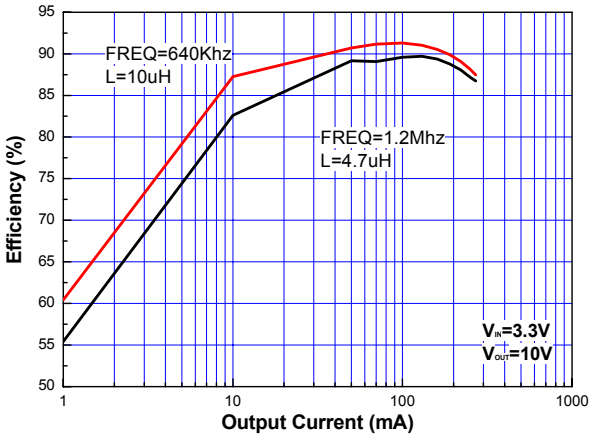


Figure 7. Efficiency vs. Output Current

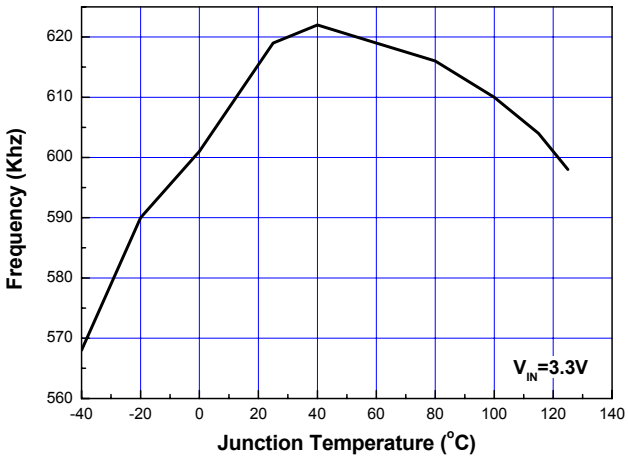


Figure 8. Frequency vs. Junction Temperature

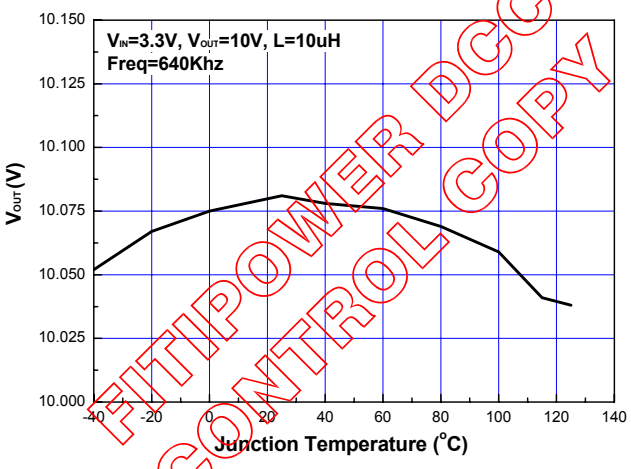
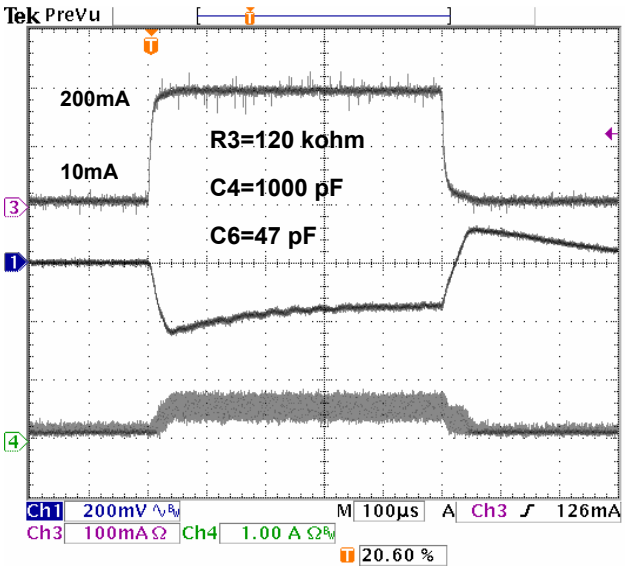


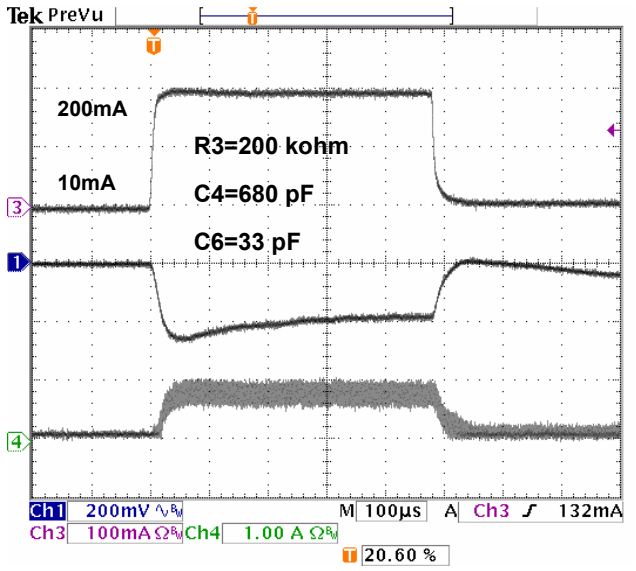
Figure 9. Output Voltage vs. Junction Temperature

Typical Performance Curves (Continued)



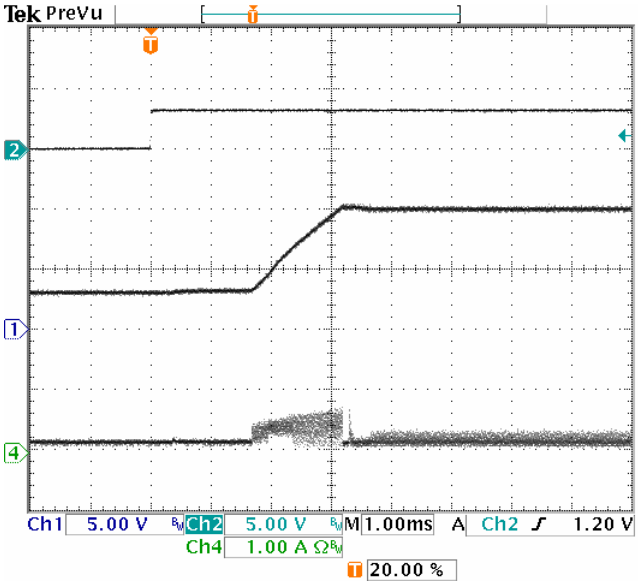
CH1: Output Voltage, AC-Coupled
CH3: Load Current
CH4. Inductor Current
V_{IN}=3.3V, V_{OUT}=10V, FREQ=640KHz,C_{OUT}=33u+0.1u

Figure 10. Load transient Response



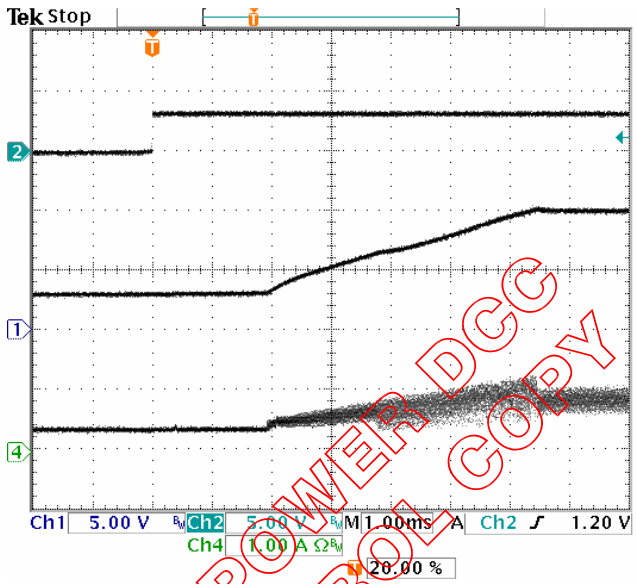
CH1: Output Voltage, AC-Coupled
CH3: Load Current
CH4. Inductor Current
V_{IN}=3.3V, V_{OUT}=10V, FREQ=1.2MHz, C_{OUT}=33uF+0.1uF

Figure 11. Load transient Response



CH1: Output Voltage
CH2: SHDN
CH4: Inductor Current
V_{IN}=3.3V, V_{OUT}=10V, I_{OUT}=10mA , L=10uH, C3=33nF, FREQ=640KHz, C_{OUT}=33uF

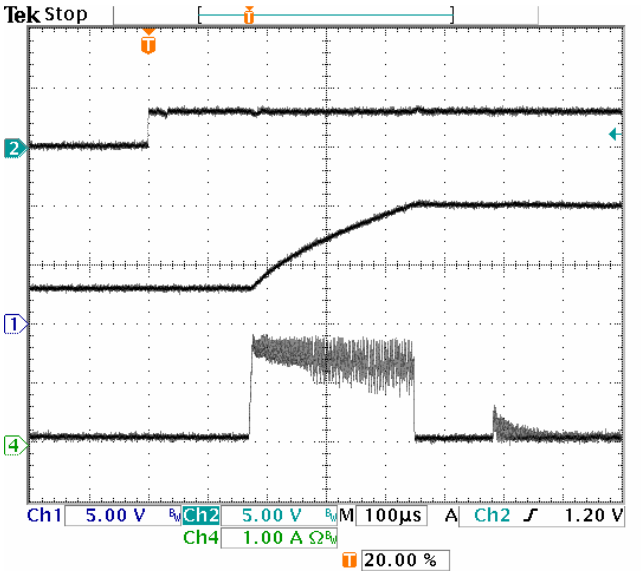
Figure 12. Start-up Waveform with Soft-start



CH1: Output Voltage
CH2: SHDN
CH4: Inductor Current
V_{IN}=3.3V, V_{OUT}=10V, I_{OUT}=200mA , L=10uH, C3=33nF, FREQ=640KHz, C_{OUT}=33uF

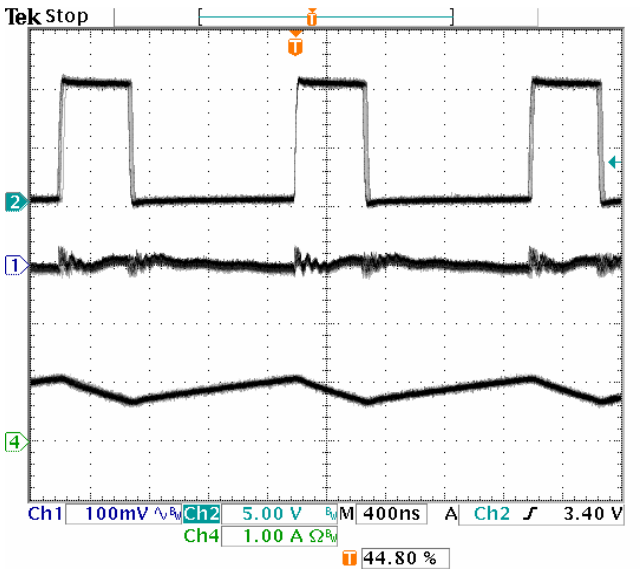
Figure 13. Start-up Waveform with Soft-start

Typical Performance Curves (Continued)



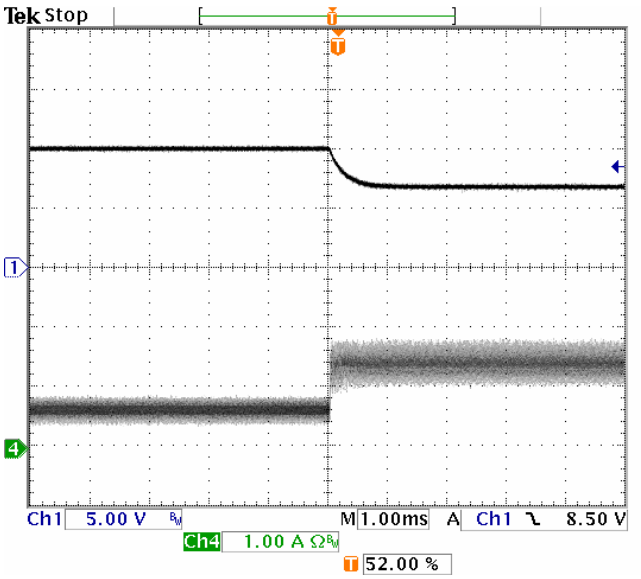
CH1: Output Voltage
CH2: $\overline{SHDN}$
CH4: Inductor Current
V_{IN}=3.3V, V_{OUT}=10V, I_{OUT}=10mA , L=10uH, without soft start, FREQ=640KHz, C_{OUT}=33uF

Figure 14. Start-up Waveform without Soft-start



CH1: Output Voltage, AC-Coupled
CH2: LX Switching Waveform
CH4: Inductor Current
V_{IN}=3.3V, V_{OUT}=10V, I_{OUT}=200mA, FREQ=640KHz, L=10uH, C_{OUT}=33uF+0.1uF

Figure 15. Switching Waveform

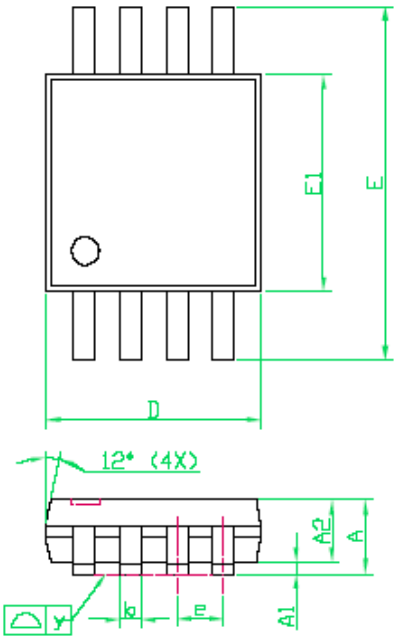


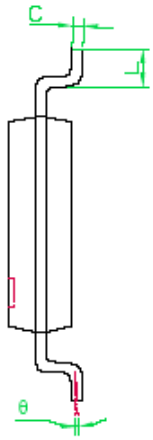
CH1: Output Voltage
CH4: Inductor Current
V_{IN}=3.3V, V_{OUT}=10V, I_{OUT}=500mA, FREQ=640KHz, L=10uH

Figure 16.OCP Waveform

Outline Information

MSOP-8 Package (Unit: mm)





SYMBOLS UNIT	DIMENSION IN MILLIMETER		
	MIN	NOM	MAX
A	0.81	1.02	1.12
A1	0.05	---	0.15
A2	0.76	0.86	0.97
b	0.28	0.30	0.38
C	0.13	0.15	0.23
D	2.90	3.00	3.10
E	4.70	4.90	5.10
E1	2.90	3.00	3.10
e	---	0.65	---
L	0.40	0.53	0.66
y	---	---	0.10
θ	0°	---	6°

Note 1：Package Body Sizes Exclude Mold Flash and Gate Burrs.
Note 2：Dimension L Is Measured in Gage Plane.
Note 3：Tolerance 0.10 mm Unless Otherwise Specified.
Note 4：Controlling Dimension Is Millimeter Converted Inch Dimensions Are Not necessarily Exact.
Note 5：Design Following JEDEC MO-187.