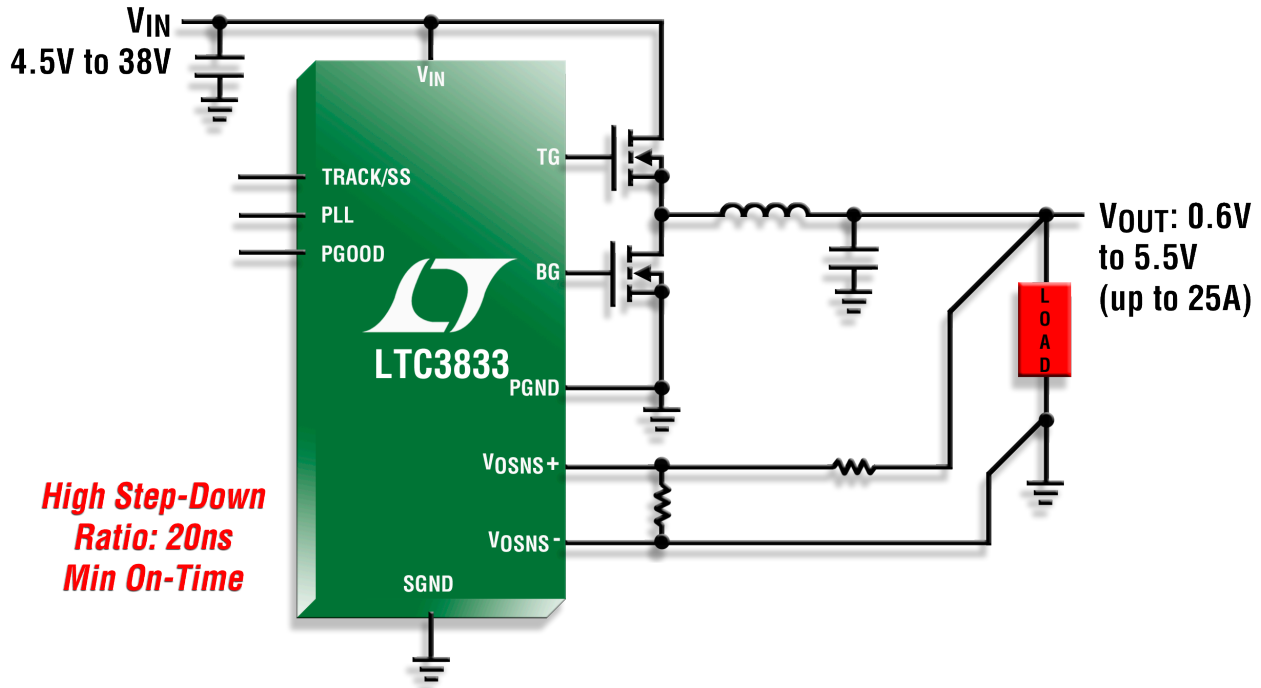


Constant On-Time High Step-Down Controllers

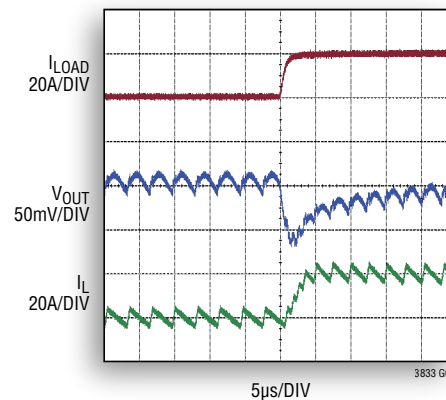


Constant on-time DC/DC buck topology controllers provide the highest step-down ratio power supplies. These controllers allow for tight frequency control, making them suitable for many fixed frequency applications. The LTC®3833 can operate up to 2MHz and still supply a tightly regulated output. High frequency operation is desired to mitigate noise interference, reduce solution size and provide excellent efficiency. A typical example is found in automotive applications when stepping down from a nominal battery voltage of 12V to 3.3V power rail at a high switching frequency to prevent interference to noise sensitive circuitry by operating above the 1.8MHz AM radio band.

Features

- V_{IN} Range: 4.5V to 38V
- V_{OUT} Range: 0.6V to 5.5V
- 20ns Min On-Time for High Step-Down Ratios
- Controlled On-Time Valley Current Mode Control
- Synchronizable 200kHz to 2MHz Frequency
- Powerful Onboard N-Channel Gate Drive
- Diff Amp for V_{OUT} Sensing
- R_{SENSE} or DCR Current Sense
- Output Tracking or Adjustable Soft Start
- Very Fast Transient Response
- Output Accuracy: $\pm 0.25\%$ at 25°C and $\pm 0.67\%$ over Temperature

Transient Response



LOAD STEP = 0A TO 20A
 $V_{IN} = 12V$, $V_{OUT} = 1.5V$
 $L_{OUT} = 0.47\mu H$,
 $C_{OUT} = 660\mu F + 200\mu F$



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Table 1. LTC3833 Efficiency vs Switching Frequency for Various Input Voltages. Power Loss is Also Shown.

	LTC3833 $V_{OUT} = 1.8V$ LOAD = 10A							
	L = 2.00 μ H	L = 0.82 μ H	L = 0.47 μ H	L = 0.20 μ H	L = 2.00 μ H	L = 0.82 μ H	L = 0.47 μ H	L = 0.20 μ H
FREQ	200KHz	500KHz	1MHz	2MHz	200KHz	500KHz	1MHz	2MHz
V_{IN} (V)	Efficiency (%)				Power Loss (W)			
6	91.50	92.50	91.10	87.50	1.68	1.47	1.76	2.58
9	92.00	92.20	90.20	86.00	1.56	1.52	1.95	2.93
12	92.10	91.70	88.90	83.60	1.55	1.63	2.24	3.54
15	91.80	90.90	87.40	80.80	1.6	1.79	2.59	4.28
18	91.60	90.10	85.90	78.00	1.65	1.99	2.96	5.07
21	91.30	89.20	84.30	75.30	1.71	2.18	3.36	5.9
24	90.90	88.30	82.70	72.80	1.79	2.39	3.77	6.73
27	90.50	87.40	81.10	70.40	1.88	2.6	4.19	7.57
30	90.10	86.40	79.60	69.80	1.97	2.82	4.62	7.77

Table 2. Detail of Output Voltage Capability Based on Input Voltage and Switching Frequency

V_{IN}	LTC3833 t_{ON} Min = 20ns			LTC3878/LTC3879 t_{ON} Min = 43ns			LTC3851A t_{ON} Min = 90ns		
	38V	24V	12V	38V	24V	12V	38V	24V	12V
FREQ (kHz)	LTC3833 V_{OUT} Min (V)			LTC3879 V_{OUT} Min (V)			LTC3851A V_{OUT} Min (V)		
250	0.6	0.6	0.6	0.6	0.6	0.6	0.95	0.6	0.6
500	0.6	0.6	0.6	0.95	0.6	0.6	1.9	1.2	0.6
750	0.86	0.6	0.6	1.43	0.9	0.6	2.85	1.8	0.9
1000	1.14	0.72	0.6	1.9	1.2	0.6	NA	NA	NA
1250	1.43	0.9	0.6	2.38	1.5	0.75	NA	NA	NA
1500	1.71	1.08	0.6	2.85	1.8	0.9	NA	NA	NA
1750	2	1.26	0.63	3.33	2.1	1.05	NA	NA	NA
2000	2.28	1.44	0.72	3.8	2.4	1.2	NA	NA	NA

Other Related Controlled/Constant On-Time Controllers

Part Number	V_{IN} Range (V)	V_{OUT} Range	Number of Outputs	Min On-Time	Clock Synchronization	Diff Amp (Remote Sensing)
LTC3833	4.5V to 38V	0.6V to 5.5V	1	20ns	√	√
LTC3878	4V to 38V	0.8V to 0.9 V_{IN}	1	43ns		
LTC3879	4V to 38V	0.6V to 0.9 V_{IN}	1	43ns		
LTC3838	4.5V to 38V	0.6V to 5.5V	2	30ns	√	√