LM26420 Evaluation Board

National Semiconductor
Application Note 1870
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Introduction

The LM26420 Evaluation board was designed to provide two 2A outputs, V_{OUT1} and V_{OUT2} . It is available in either the eTSSOP package option of the LM26420 for easier probing or the LLP version for evaluating the smaller package. The design emphasizes on the compactness of the LM26420 PCB layout and is thermally optimized. The total solution size is less than 35mm by 40mm. The board supports the conversion from an input voltage ranging from 3V to 5.5V down to output voltages of 0.8V for each channel. V_{OUT1} and V_{OUT2} are set to 1.2V and 2.5V respectively. The feedback resistor can be changed to support output voltages as low as 0.8V or as high at 4.5V, assuming V_{IN} is high enough to support it. The EN pins are pulled up to V_{IN} by jumpers for easy evaluation but can also be easily controlled by external logic.

The board's specifications are:

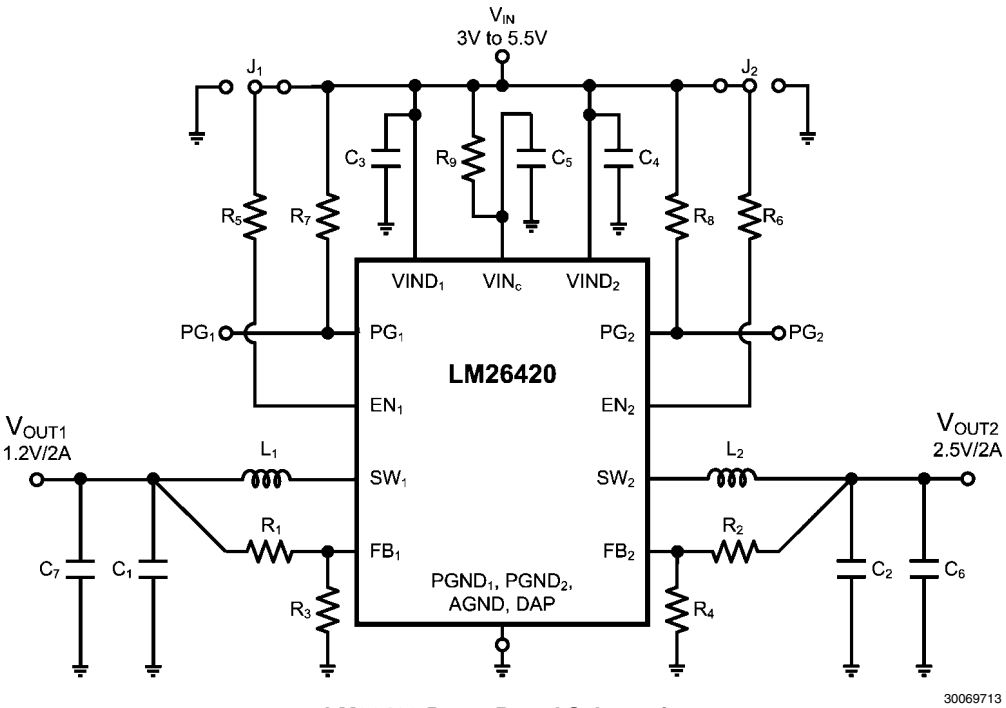
- Input Voltage: 3V to 5.5V
- Output Voltages: 1.2V$_{OUT1}$ and 2.5V$_{OUT2}$
- Maximum load current: 2A/output
- Minimum load current: 0A
- Size: 1.35 in. x 1.6 in.
- Peak Current Limit: ≅ 3.2A at 25°C
- Nominal Switching Frequency: 550 kHz or 2.2MHz

Powering Up The Board

Since the EN pins are directly tied to the input voltage via jumpers J_1 and J_2, starting up the board is as simple as connecting a voltage supply from 3V to 5.5V between the V_{IN} and GND terminals. There should be 1.2V on V_{OUT1} and 2.5V on V_{OUT2}, assuming the jumpers connect V_{IN} to EN for each channel. Great care should be taken in powering up the supplies such that the input voltage, V_{IN}, does not exceed the Absolute Maximum Rating of 7V. If the part experiences voltages greater than 7V for a prolonged period of time, then damage to the part can occur and then the evaluation board may cease working.

The linear soft-start ramps for the two output voltages and should last about 600 µs. Load can be applied prior to power-up. If an output is shorted either before or after start-up, removal of the short-circuit condition should bring the corresponding output back to normal voltage.

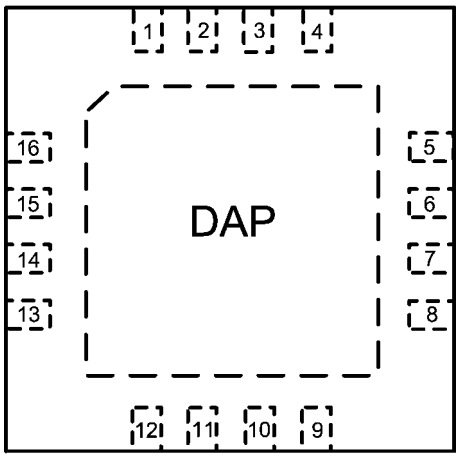
Typical Application Circuit



LM26420 Demo Board Schematic

LLP Board Schematic

Connection Diagram



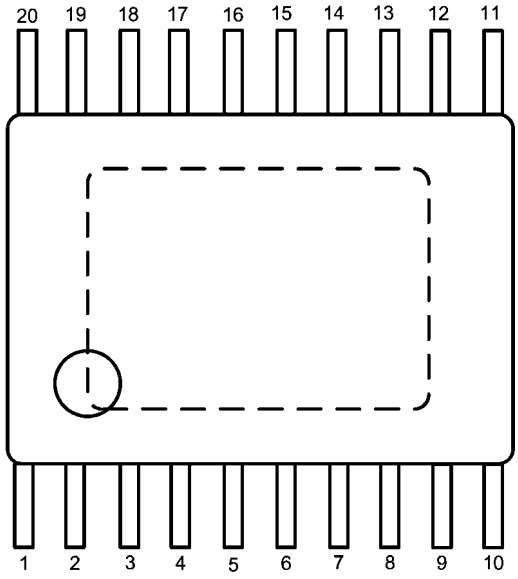
16-Pin LLP (TOP VIEW)

Pin Descriptions 16-Pin LLP

Pin	Name	Function
1,2	$VIND_1$	Power Input supply for Buck1.
11, 12	$VIND_2$	Power Input supply for Buck2.
15	VINC	Power Input supply for control circuitry.
4	$PGND_1$	Power ground pin for Buck 1.
9	$PGND_2$	Power ground pin for Buck 2.
14	AGND	Signal ground pin. Place the bottom resistor of the feedback network as close as possible to pin.
6	PG_1	Power Good Indicator for Buck 1. Pin is connected through a resistor to an external supply (open collector output).
7	PG_2	Power Good Indicator for Buck 2. Pin is connected through a resistor to an external supply (open collector output).
5	FB_1	Feedback pin for Buck 1. Connect to external resistor divider to set output voltage.
8	FB_2	Feedback pin for Buck 2. Connect to external resistor divider to set output voltage.
3	SW_1	Output switch for Buck 1. Connect to the inductor.
10	SW_2	Output switch for Buck 2. Connect to the inductor.
16	EN_1	Enable control input. Logic high enable operation for Buck 1. Do not allow this pin to float or be greater than VIN + 0.3V.
13	EN_2	Enable control input. Logic high enable operation for Buck 2. Do not allow this pin to float or be greater than VIN + 0.3V.
DAP	Die Attach Pad	Connect to system ground for low thermal impedance and as a primary electrical GND connection.

eTSSOP Board Schematic

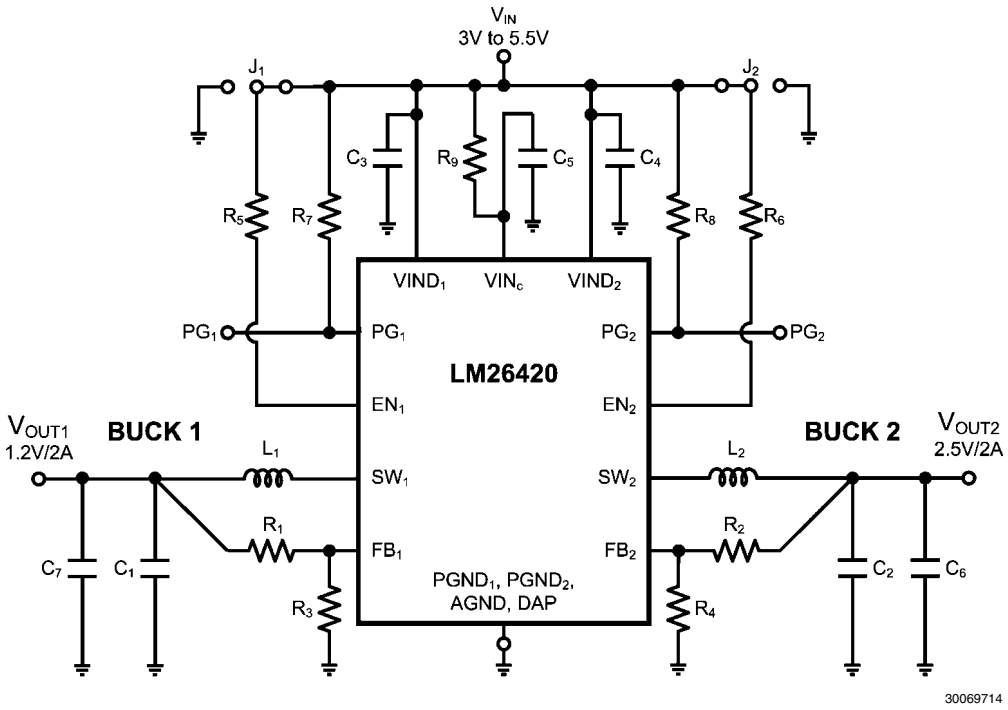
Connection Diagram



20-Pin eTSSOP (TOP VIEW)

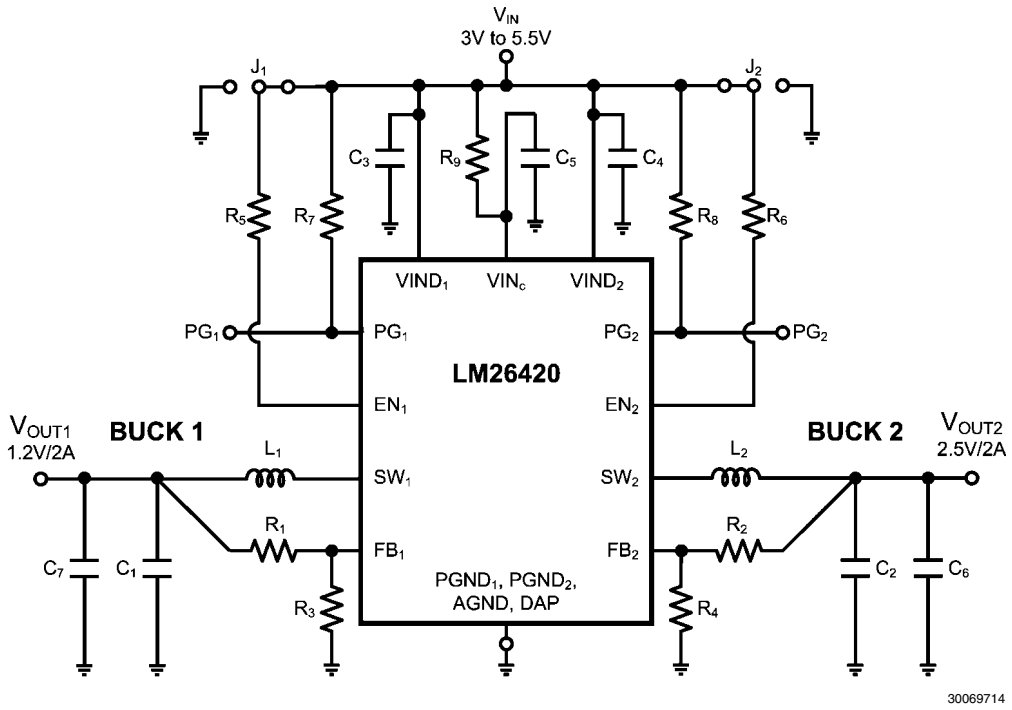
Pin Descriptions 20-Pin eTSSOP

Pin	Name	Function
3, 4	$VIND_1$	Power Input supply for Buck1.
17, 18	$VIND_2$	Power Input supply for Buck2.
1	VINC	Power Input supply for control circuitry.
6,7	$PGND_1$	Power ground pin for Buck 1.
14, 15	$PGND_2$	Power ground pin for Buck 2.
20	AGND	Signal ground pin. Place the bottom resistor of the feedback network as close as possible to pin.
9	PG_1	Power Good Indicator for Buck 1. Pin is connected through a resistor to an external supply (open drain output).
12	PG_2	Power Good Indicator for Buck 2. Pin is connected through a resistor to an external supply (open drain output).
8	FB_1	Feedback pin for Buck 1. Connect to external resistor divider to set output voltage.
13	FB_2	Feedback pin for Buck 2. Connect to external resistor divider to set output voltage.
5	SW_1	Output switch for Buck 1. Connect to the inductor.
16	SW_2	Output switch for Buck 2. Connect to the inductor.
2	EN_1	Enable control input. Logic high enable operation for Buck 1. Do not allow this pin to float or be greater than VIN + 0.3V.
19	EN_2	Enable control input. Logic high enable operation for Buck 2. Do not allow this pin to float or be greater than VIN + 0.3V.
10,11	NC	No Connect.
DAP	Die Attach Pad	Connect to system ground for low thermal impedance, but it cannot be used as a primary GND connection.



Bill of Materials - X Version

Item	Designator	Description	Manufacturer	Part No.	Qty.
1	C1, C2, C3, C4, C6, C7	22µF, 6.3V, X5R, 1206	TDK	C3216X5R0J226(M or K)	6
2	C5	0.47µF, 16V, X7R, 0603	TDK	C2012X7R1C474K	1
3	L1, L2	1µH, 6.4A	TDK	SPM6530T-1R0M120 or RLF7030T-1R0N6R4	2
4	R1	5.1k, 1%, 603	Vishay	CRCW06035K10F	1
5	R2	21.3k, 1%, 603	Vishay	CRCW060321K3F	1
6	R7, R8	49.9k, 1%, 603	Vishay	CRCW060349K9F	2
7	R3, R4, R5, R6	10k, 1%, 603	Vishay	CRCW060310K0F	4
8	R9	5.1 Ohm, 1%, 805	Vishay	CRCW06035R10F	1
9	J1, J2	Jumper for Enables	Sullins Connector Solutions	STC02SYAN	2
10	TP1-TP8	0.094" Diameter Solder Terminal	Keystone Electronics	5011	8
11	U1	Dual 2A, 2.2MHz PWM Switcher, eTSSOP-20 or LLP-16	National	LM26420XMH or LM26420XSQ	1

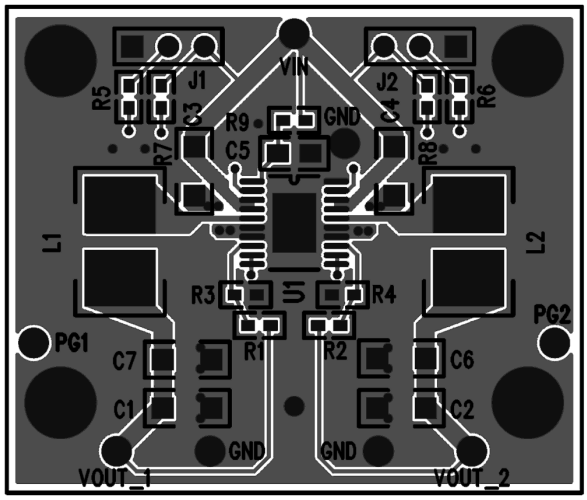


Bill of Materials - Y Version

Item	Designator	Description	Manufacturer	Part No.	Qty.
1	C1, C2, C3, C4, C6, C7	22µF, 6.3V, X5R, 1206	TDK	C3216X5R0J226(M or K)	6
2	C5	0.47µF, 16V, X7R, 0603	TDK	TMK105BJ104KV-F	1
3	L1, L2	3.3µH, 6.4A	TDK or Coilcraft	RLF7030T-3R3M4R1 or MSS7341-332NL_	2
4	R1	5.1k, 1%, 603	Vishay	CRCW06035K10F	1
5	R2	21.3k, 1%, 603	Vishay	CRCW060321K3F	1
6	R7, R8	49.9k, 1%, 603	Vishay	CRCW060349K9F	2
7	R3, R4, R5, R6	10k, 1%, 603	Vishay	CRCW060310K0F	4
8	R9	5.1 Ohm, 1%, 805	Vishay	CRCW06035R10F	1
9	J1, J2	Jumper for Enables	Sullins Connector Solutions	STC02SYAN	2
10	TP1-TP8	0.094" Diameter Solder Terminal	Keystone Electronics	5011	8
11	U1	Dual 2A, 550kHz PWM Switcher, eTSSOP-20 or LLP-16	National	LM26420YMH or LM26420YSQ	1

eTSSOP-20 PCB Layout

eTSSOP - Top Layer



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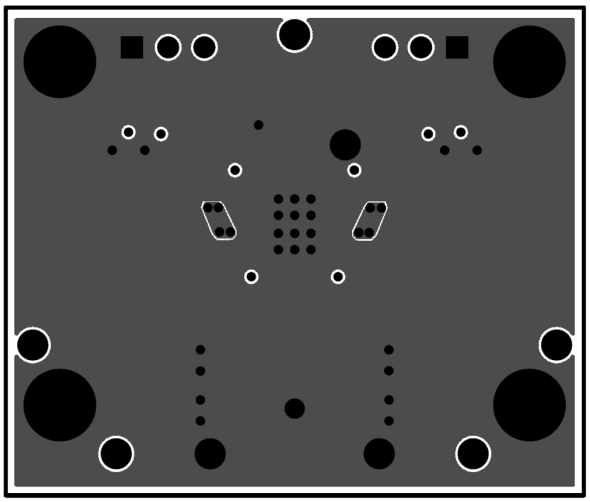
eTSSOP - Layer 2



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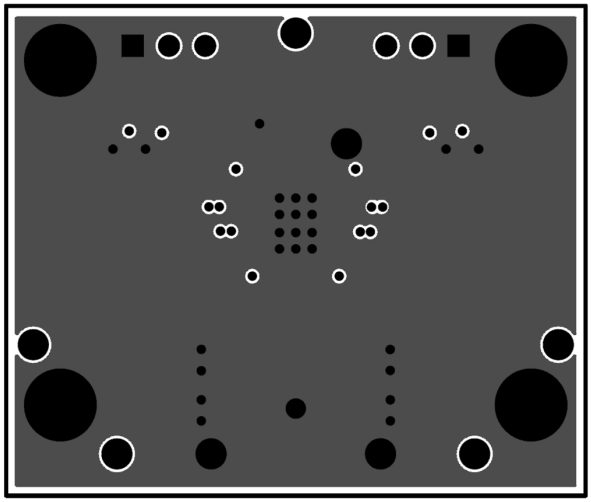
eTSSOP - Layer 3



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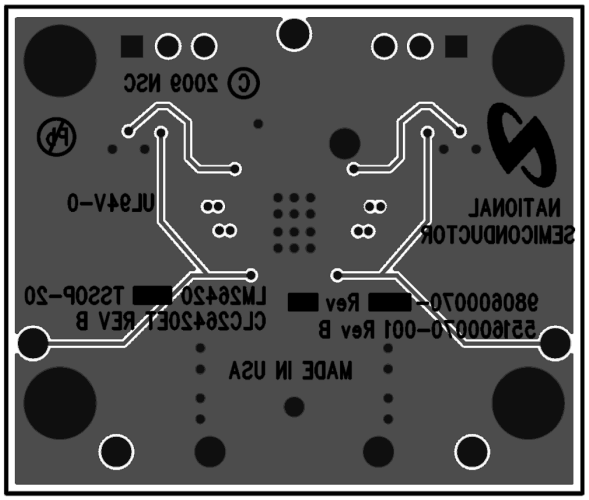
eTSSOP - Bottom Layer



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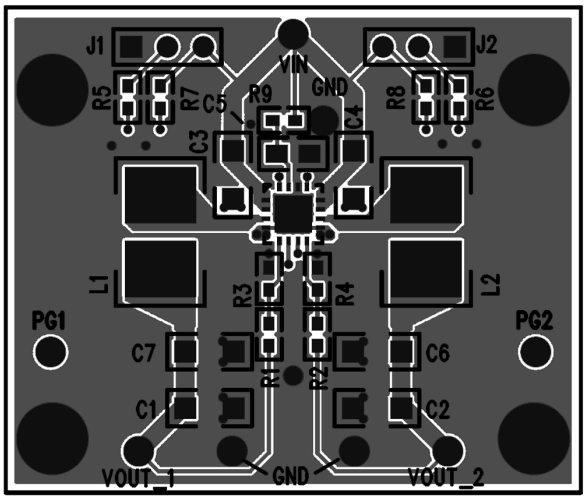
LLP-16 PCB Layout

LLP - Top Layer



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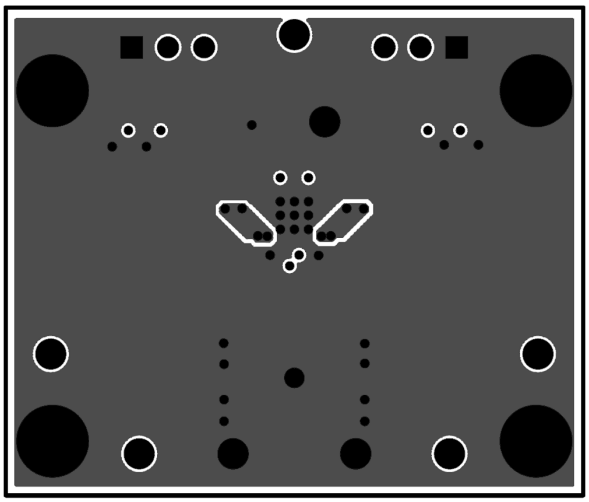
LLP - Layer 2



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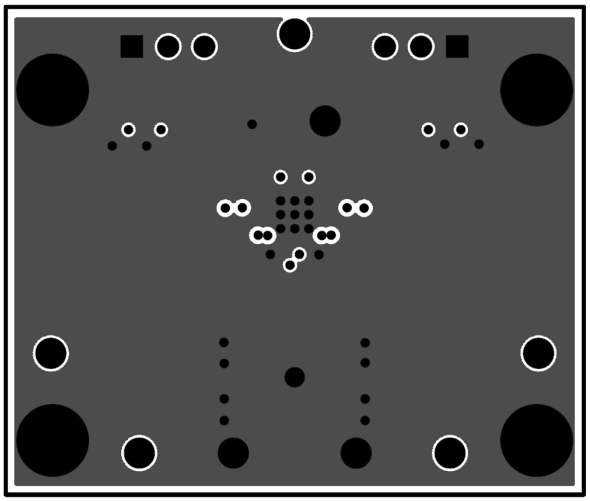
LLP - Layer 3



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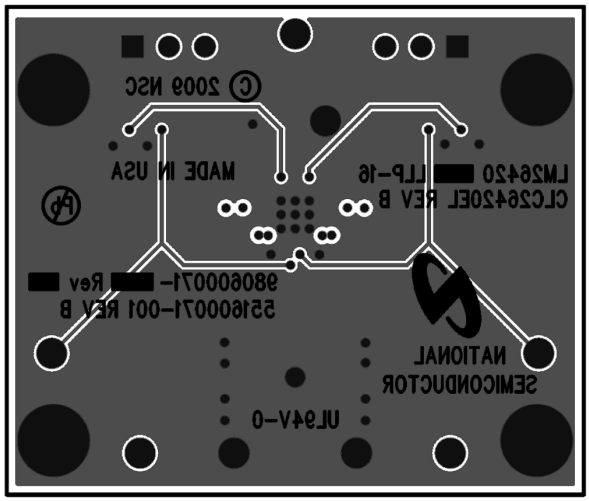
LLP - Bottom Layer



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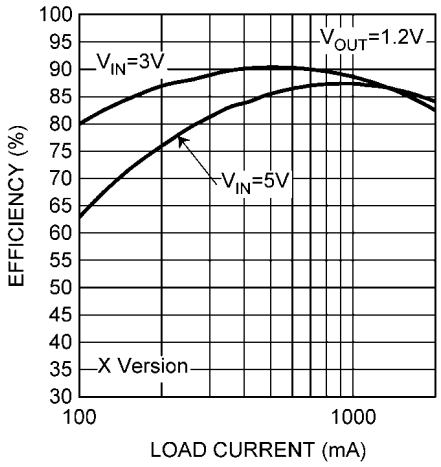
Typical Performance Characteristics

Efficiency - 1.2V_{OUT} - X Version



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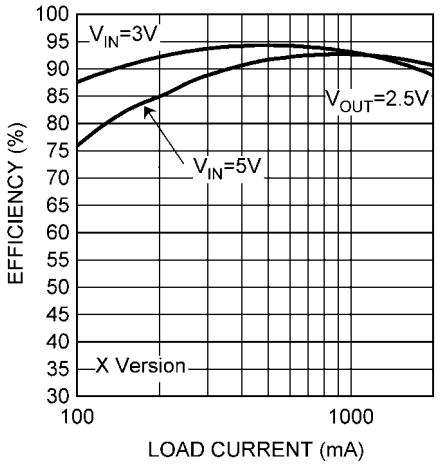
Efficiency - 2.5V_{OUT} - X Version



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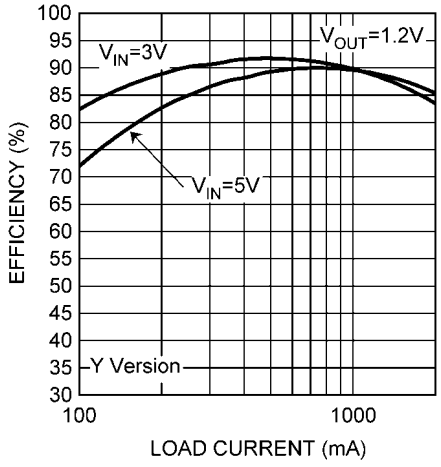
Efficiency - 1.2V_{OUT} - Y Version



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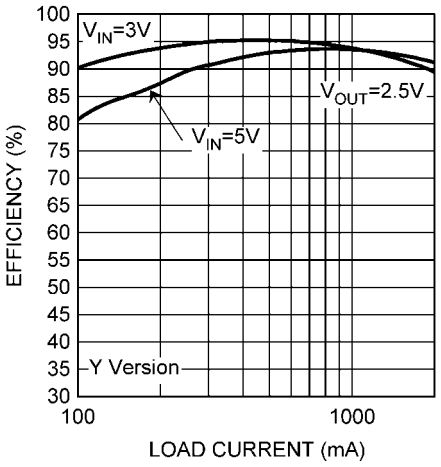
Efficiency - 2.5V_{OUT} - Y Version



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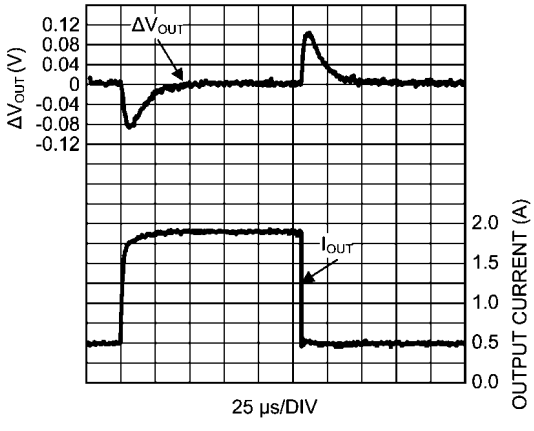
Load Step Response - X Version



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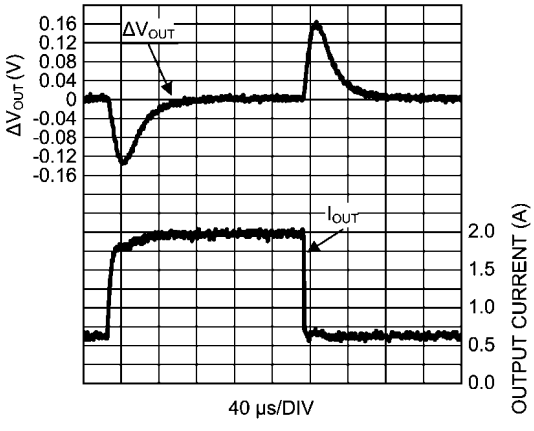
Load Step Response - Y Version



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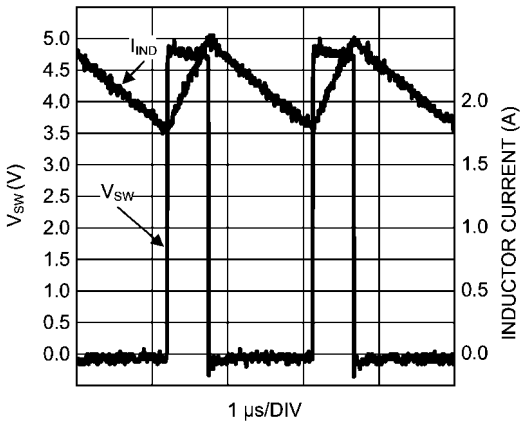
Typical Performance Characteristics

Steady State Operation - Y Version



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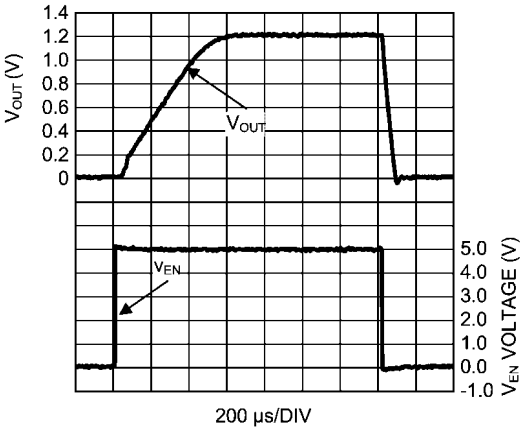
Enable



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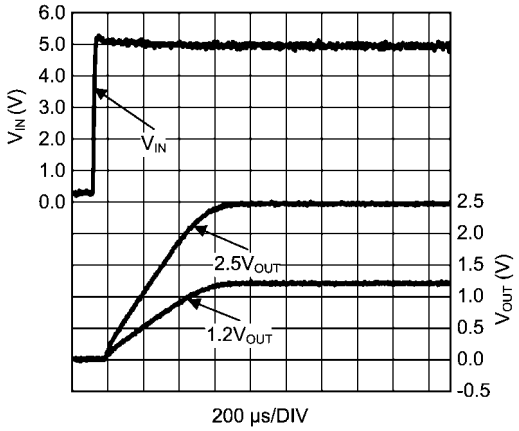
Start-up - V_{IN} Applied



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Notes

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