

# LM3152-3.3 Demonstration Board

National Semiconductor  
LM3152-3.3  
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## 1.0 Design Specifications

Inputs	Output #1
VinMin=6V	Vout1=3.3V
VinMax=24V	Iout1=10A

## 2.0 Design Description

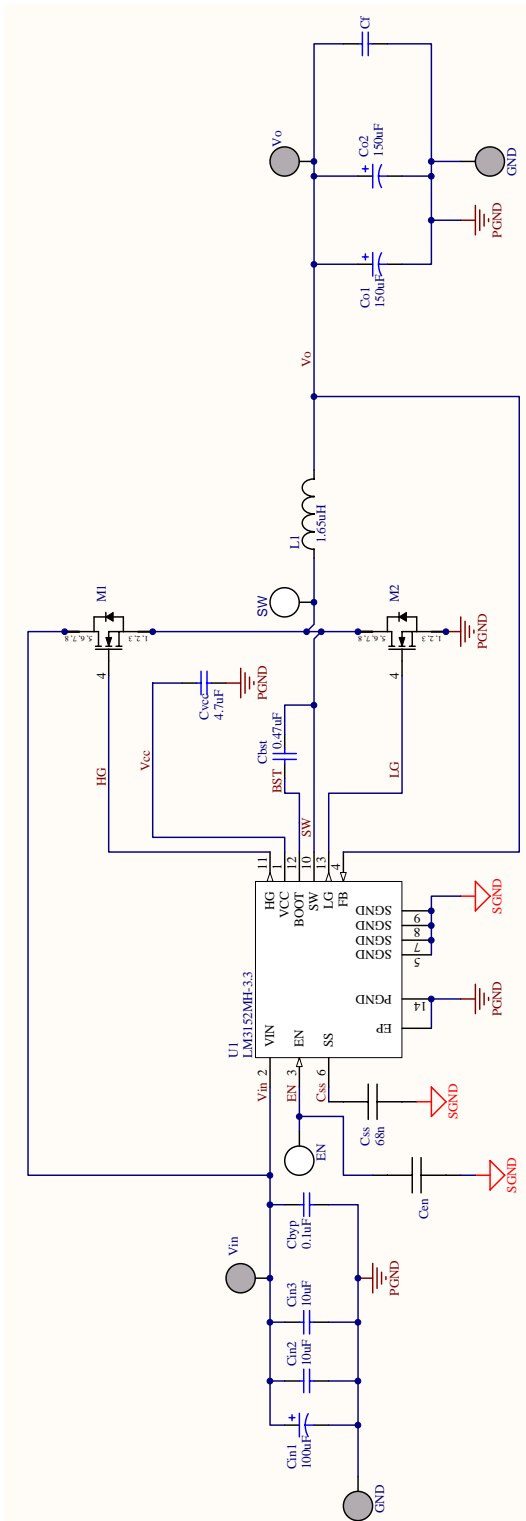
The LM3152-3.3 demonstration board is part of the PowerWise® family of SIMPLE SWITCHER® Controllers. It has been designed to balance solution size and performance. The Constant-On-Time (COT) Emulated Ripple Mode (ERM) Control allows for the use of low ESR output capacitors and therefore decreases the output voltage ripple while maintaining a fast transient response. There is no loop compensation required for the COT architecture, as there is in voltage-mode and current mode control architectures, which helps to facilitate the ease of design and fast transient response. The demo board uses a 2-layer, 2 ounce copper PCB with all of the components mounted on the top side. The LM3152-3.3 IC has a fixed output voltage of 3.3V and will operate over the input voltage range of 6V to 24V at 10A load current. The components within the dashed line of the board photo in Figure 3, represent the total design solution. The aluminum electrolytic input capacitor Cin1 is used for input filter damping when using long leads, which contributes to parasitic induc-

tance in the lab while using the demo board. Cin1 along with the input/output posts and EN test point connector may not be needed when the final circuit is integrated in the system design.

## 3.0 Features

- Easy To Use with Webench and Offline Design Tools
- No Loop Compensation Required
- Low Solution Component Count
- Ultra-Fast Transient Response
- Low Output Voltage Ripple (32mVpp)
- 3.3V Fixed Output Voltage
- Optimized for 10A Average Load Current
- 95% Peak Efficiency
- Constant-On-Time with Emulated Ripple Mode Control
- 500kHz Switching Frequency

# 4.0 Schematic



schematic6

FIGURE 1. LM3152-3.3 Demo Board Schematic

## 5.0 Bill of Materials

Designator	Manufacturer	Part Number	Value	Parameters
U1	National Semiconductor	LM3152MH-3.3		Simple Controller
Cbst	TDK	C2012X7R1C474K	0.47uF	Ceramic, 0805, X7R, 16V, 10%
Cbyp	TDK	C2012X7R1H104K	0.1uF	Ceramic, 0805, X7R, 50V, 10%
Cen	TDK	C1005X7R1H102K	1000pF	Ceramic, 0402, X7R, 50V, 10%
Cf				Not Fitted
Cin1	Panasonic	EEV-FK1J101P	100uF	AL, EEV-FK, 63V, 20%
Cin2, Cin3	Taiyo Yuden	GMK325BJ106KN-T	10uF	Ceramic, 1210, X5R, 35V, 10%
Co1, Co2	Panasonic	EEF-UE0J151R	150uF	Polymer AL, UE, 6.3V, 20%
Css	AVX	0603YC683KAT2A	0.068uF	Ceramic, 0603, X7R, 16V, 10%
Cvcc	MuRata	GRM21BR71C475KA73L	4.7uF	Ceramic, 0805, X7R, 16V, 10%
L1	Coilcraft Inc.	HA3778-AL	1.65uH	Shielded Drum Core, 17A, 2.53mΩ
M1, M2	Renesas	RJK0305DB	30V	LFPAK, 30Vds, N-MOSFET

bom3

FIGURE 2. Bill of Materials

## 6.0 Other Operating Values

Operating Values

Description	Parameter	Value	Unit
Switching Frequency	Frequency	500	KHz
Max Average Load Current	I <sub>out</sub>	10	A
Max Steady State Efficiency	Efficiency	95	%
Control Scheme	Control Scheme	COT	
Peak-to-Peak Output Ripple Voltage	V <sub>outp-p</sub>	32	mV
Minimum Input Voltage	V <sub>inmin</sub>	6	V
Maximum Input Voltage	V <sub>inmax</sub>	24	V

## 7.0 Board Photos



boardphoto4

FIGURE 3. LM3152-3.3 Demo Board Photo



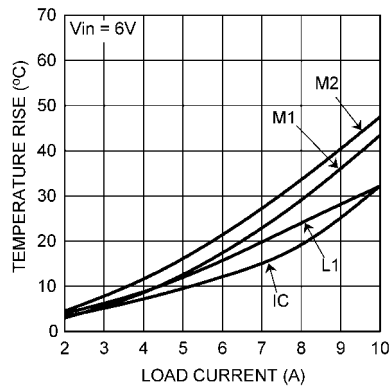
Cin1 is optional and used for filtering the supply connected to Vin.

Components within the dashed line represent the NSC solution, components are included for ease of connection during demonstrations.

layout9

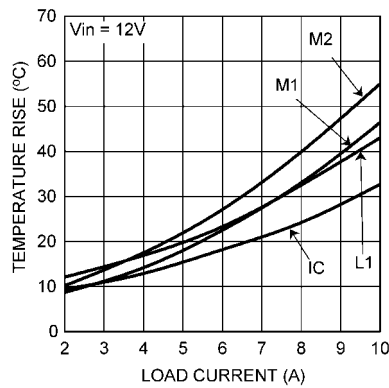
FIGURE 6. Bottom Silkscreen

### 10.0 Waveforms



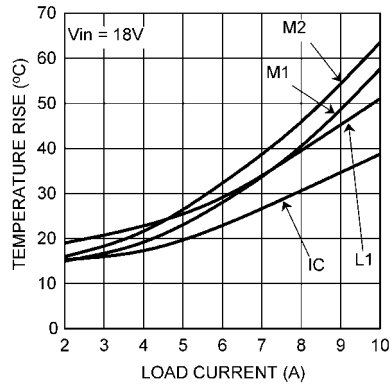
waveform1

FIGURE 7. Component Temp Rise vs Load Vin = 6V



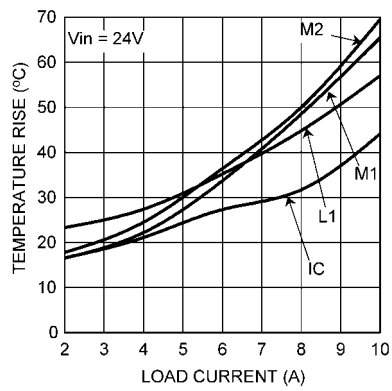
waveform2

FIGURE 8. Component Temp Rise vs Load Vin = 12V



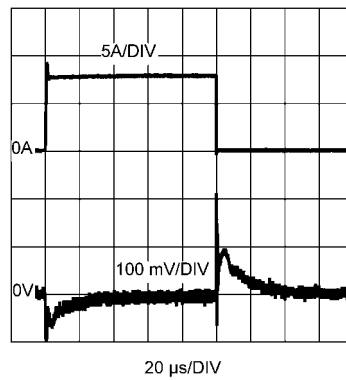
waveform3

FIGURE 9. Component Temp Rise vs Load  $V_{in} = 18V$



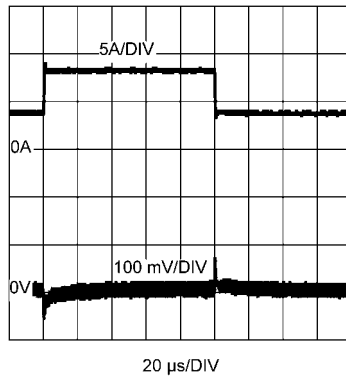
waveform4

FIGURE 10. Component Temp Rise vs Load  $V_{in} = 24V$



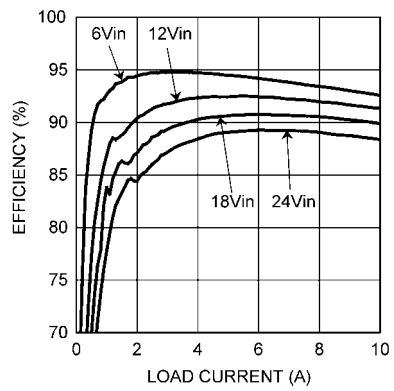
waveform7

FIGURE 11. Load Transient 0A to 8A



waveform8

**FIGURE 12. Load Transient 3.6A to 8A**



waveform9

**FIGURE 13. Efficiency vs. Load Current**

# Notes

LM3152-3.3

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