

GDCVRR5164-DEV 6-98V 700mA Low Ripple Switching Voltage Regulator Dev Board

1. Features

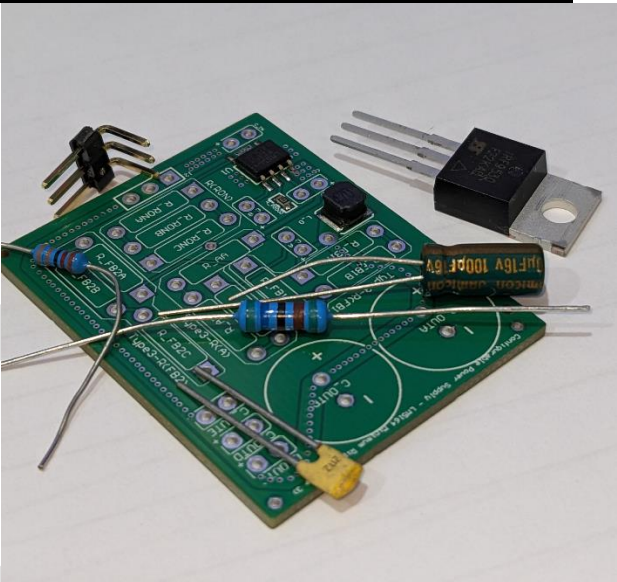
- Development or Custom voltage board
- Use instead of TO-220 Linear Voltage regulator or to test configuration prior to ordering GDCVRR1564-XX-XXX
- Input voltage range 6V to 100V
- Output Current up to 1A
- Ultra Low Ripple (10mv peak-to-peak)
- Drops down voltage from much higher starting voltage than LDOs
- Thermal management is not required
- High efficiency (typically > 90%)

2. Applications

- Testing configuration prior to ordering GDCVRR15640-XX-XXX for specific voltage
- Microcontroller power supply
- IC Logic power
- Relay and Cooling fan power

3. Description

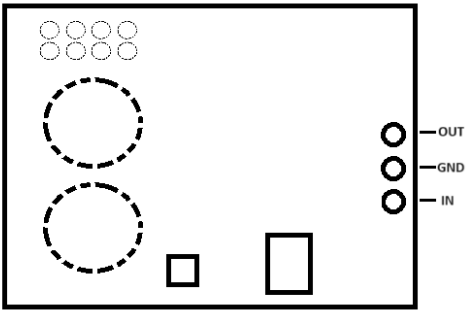
The GDCVRR5164 range of buck converters are designed to be a pin-for-pin replacement for positive linear voltage regulators (LDOs). These regulators are based on the Texas Instruments LM5164 configured as Low Ripple (COT Type III) and provide step down voltage from between 6V - 100V down to between 3.3V and 98V. This provides efficient regulated output over a wide range of input voltages making it possible to step down from much higher voltages than is typical for LDOs without the need for thermal management. This development/custom board has through hole footprints to allowing a specific performance profile to be configured using off-the-shelf components.



Device Information

Dimensions mm (+/- 0.1)		
Width	Height	Depth (unpopulated)
35.4	44.5	4.5

4. Pin Configurations



PIN Outs		
Name	#	Function
IN	1	Unregulated voltage (50V max) (must be 2V+ higher than OUT)
GND	2	Ground
OUT	3	Filtered/regulated output voltage

## 5. Specifications

### Absolute Maximum Ratings

Specification	MIN	MAX	UNIT
Input Voltage	5.3	100	V
Output Voltage	3.3	98	V
Continuous Output Current	-	1	A
Operating junction temperature ( $T_J$ )	-40	150	°C
Storage Temperature( $T_{stg}$ )	-65	150	°C

\*

### Recommended Ratings

Specification	MIN	MAX	UNIT
Input Voltage	6	62	V
Output Voltage	3.3	50	V
Continuous Output Current	200	700	mA
Operating junction temperature ( $T_J$ )	0	100	°C
Storage Temperature( $T_{stg}$ )	-65	150	°C

## 6. Detailed Schematic

The GDCVRR4165-DEV detailed schematic in Figure 1 follows the recommendations of Texas Instruments for the COT III (low ripple) implementation. Components with fixed values are suitable for all output voltages. Components without a specified value can be chosen to provide a specific performance profile in accordance with the Texas Instruments LM5164 calculation sheet. A 33 $\mu$ H inductor is include which is suitable for lower voltages at outputs above 200mA see table .... Multiple in-series footprints provide flexibility to combine standard resistor sizes for finer output voltage and Frequency adjustment.

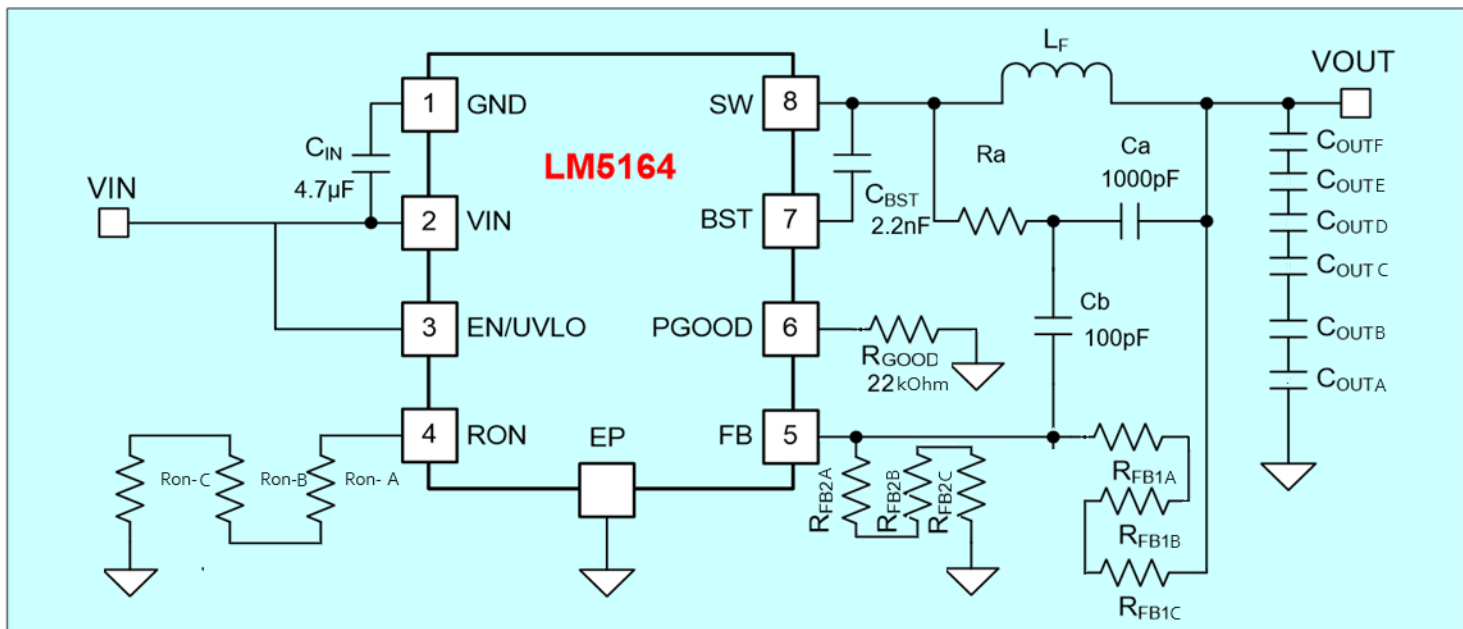


Figure 1 - Detailed Schematic

## 7. Fixed Components

The following components are common to all version of the GDCVRR5164.

Designator	Component	Fixed value
C <sub>IN</sub>	Filter capacitor (fixed)	4.7uF
C <sub>BST</sub>	Boost Feedback	2.2nF
Ca	Low ripple capacitor A	1000pF
Cb	Low ripple capacitor B	100Pf
RGOOD	Always On	22kOhm

## 8. Example Configurations

### 5V output – High continuous Load (700mA) with default Inductor 33μH

#### Voltage Input and Output

RFb1	RFB2	CIN	COUT
470kΩ	147kΩ	>2.2μF (4.7μF)	>10uF (100μF)

#### Suggested Timing and Current Ripple at nominal Input voltages 700mA Load

Input V (nominal)	Ron (Total) kOhm	RA kOhm	Frequency (kHz)	Current Ripple (mApk-pk)	Efficiency
7	88.7	1000	142	228	90%
9	56.2	1000	222	269	91%
12	42.2	976	297	283	90%
15	35.7	953	350	282	90%
18	32.4	931	387	280	89%
24	29.4	931	427	283	85%
36	26.7	909	473	282	84%
48	25.5	909	495	282	79%

### 5V output – low continuous Load (250mA) Replace inductor 67uH

Input V (nominal)	Ron (Total) kOhm	RA kOhm	Frequency (kHz)	New Inductance	Current Ripple (mApk-pk)	Efficiency
7	46.4	532	270	67	72	85-90%
9	30.9	562	400	67	269	91%
12	23.2	549	535	67	283	90%
15	20	536	620	67	282	90%
18	18.2	536	680	67	280	89%
24	16.9	536	740		80	85%
36	26.7	909	473		282	50%
48	25.5	909	495		282	79%

### 12V output – Typical performance characteristics Vs Inductance

<b>9V output – Typical performance characteristics</b>				
Nominal Input Voltage	20 $\mu$ H	33 $\mu$ H	100 $\mu$ H	Recommended configuration
14	340kHz/90-95%	220kHz /90-95%	100kHz/85-91%	50kHz/120 $\mu$ H / 85-92%
16	465kHz/91-94%	285kHz /92-95%	93kHz/82-91%	50kHz/270 $\mu$ H / 84-92%
18	650kHz/89-93%	400kHz /90-95%	130kHz/92-95%	50kHz/270 $\mu$ H / 84-92%
24	NR*	635kHz /85-92%	205kHz/91-95%	50kHz/270 $\mu$ H / 84-92%
36	NR*	850kHz /70-84%	285kHz/86-94%	50kHz/330 $\mu$ H ~ 82-91%
48	NR*	960kHz /70-84%	325kHz/86-92%	
60	NR*	NR*	348kHz/79-89%	

**\*NR not recommended (efficiency exceeds frequency parameters)**

## 9. Typical Efficiency

The choice of specific components for different versions of the GDCVRR5164 can be optimised in a number of ways. For example, selecting the optimal configuration for maximum efficiency at an expected known input voltage. Figure 3 shows how the efficiency of the converter varies at a range of input voltages when it has been optimised for a 5V output where the nominal input is 12V. Always consider the Frequency and Thermal parameters when selecting components

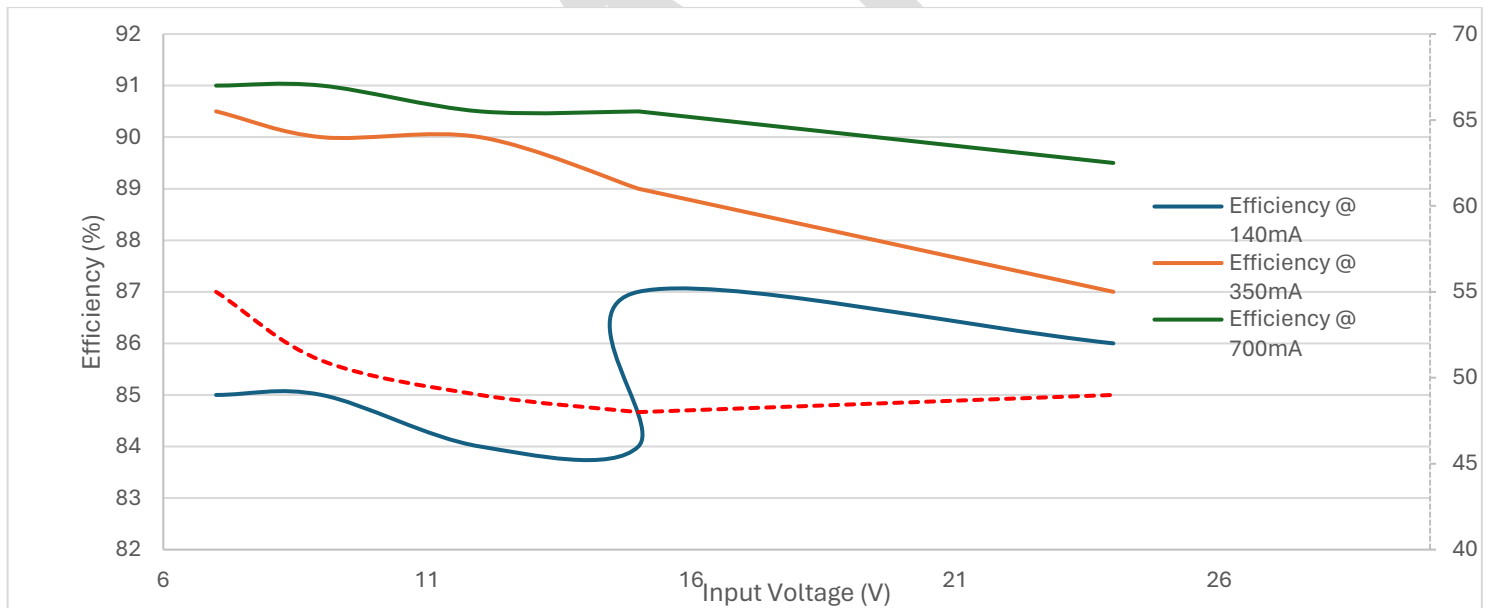


Figure 2 Efficiency Vs input voltage at Output Voltage=5V, Frequency=297kHz and Inductance =33 $\mu$ H. Represents a regulator that has been optimised for 5V output with 12V input.

## 10. References

Please refer to the Texas Instruments [LM5164 100-V Input, 1-A Synchronous Buck DC/DC Converter](#) datasheet at [ti.com](https://www.ti.com) for detailed information about the LM5164 Buck converter and the COT III implementation.

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11. Ordering Information

GDCVRR5164-xxx		
xxx	Example	Output
The output voltage in dV	GDCVRR5164-33	3.3V
	GDCVRR5164-240	24.0V

*Note: Any fixed voltage between 3.3V and 48V is available (non-standard output voltages must be pre-ordered). Use the GDCVRR5164-DEV for custom designs.*