DC/DC Converter

Application Information

IC Product Name	BD9G201EFJ-M
Topology	Buck (Step-Down) Switching Regulator
Type	Non-Isolation

No	VIN[V]	Output	Frequency[kHz]	Conditions
1	10 to 42	5V, 1.5A	300	
2	12 to 42	8V, 1.5A	300	
3	16 to 42	12V, 1.5A	300	
4	32 to 42	24V, 1.5A	300	COUT=47µF x 2
5	32 to 42	24V, 1.5A	300	COUT=22µF x 5
6	32 to 42	24V, 1.5A	300	COUT=100µF

Typical Application Circuit

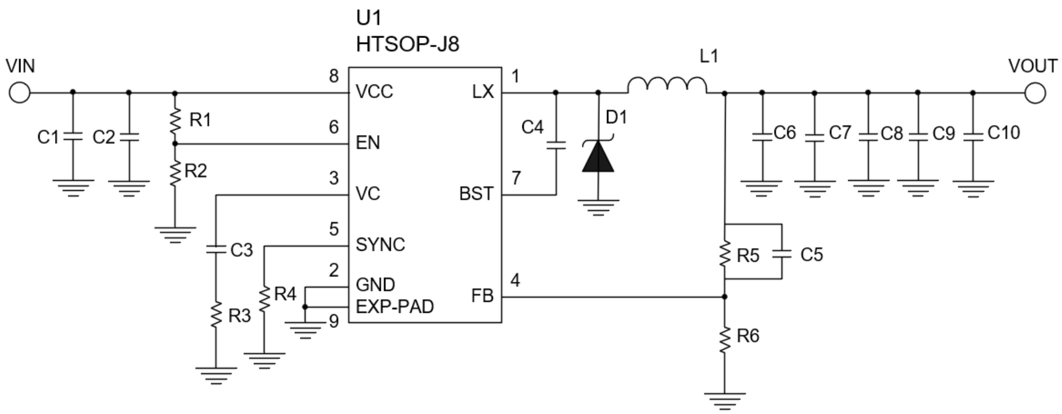

Figure 1. Schematic

EN pin setting (6-pin)

Table 1. EN pin setting and IC operation

Pin state	IC operation
≥ 1.8V	Normal operation
≤ 1.4V	Internal REG is turned on
≤ 0.3V	Power down

UVLO detect voltage setting with EN pin external resistor

$$R1 = \frac{V_{\text{start}} - V_{\text{stop}}}{IEN} \ [\Omega]$$

$$R2 = \frac{VEN \times R1}{V_{\text{start}} - VEN} \ [\Omega]$$

IEN: EN pin source current 10µA (Typ)

VEN: EN pin output on threshold 1.8V (Typ)

V_{start}: Desired UVLO release voltage

V_{stop}: Desired UVLO detect voltage.

Soft Start with External CLK

The SYNC pin can be used to synchronize the regulator to an external system clock(250kHz to 500kHz). Soft start time with external clock is calculated as below.

$$T_{\text{soft}} = \frac{300}{f_{\text{osc\_ex}}} \times 8 \ [\text{ms}]$$

Where:

T_{soft} is the softstart time [ms];

f_{osc_ex} is the external clock [kHz]

Inductor

Shielded type that meets the current rating (current value from the Ipeak below), with low DCR (Direct Current Resistance element) is recommended.

$$Ipeak = IOUT + \frac{\Delta IL}{2} \text{ [A]}$$

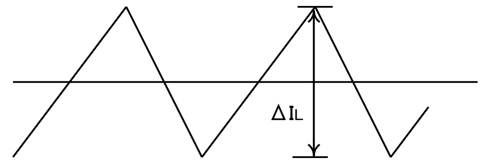

Figure 2. Inductor ripple Current

The value of inductor has an effect in the inductor ripple current which causes the output ripple. In the same formula below, this ripple current can be made small with a large value L of the coil or as high as the switching frequency.

$$\Delta IL = \frac{VIN - VOUT}{L} \times \frac{VOUT}{VIN} \times \frac{1}{f} \text{ [A]}$$

Where:

⊿ IL is the Inductor ripple current;

f is switching frequency.

For design value of inductor ripple current, please carry out design tentatively with about 20% to 50% of the maximum output current of the IC. The minimum value of inductance is shown in the following figure. Inductor is selected over the value of the graph.

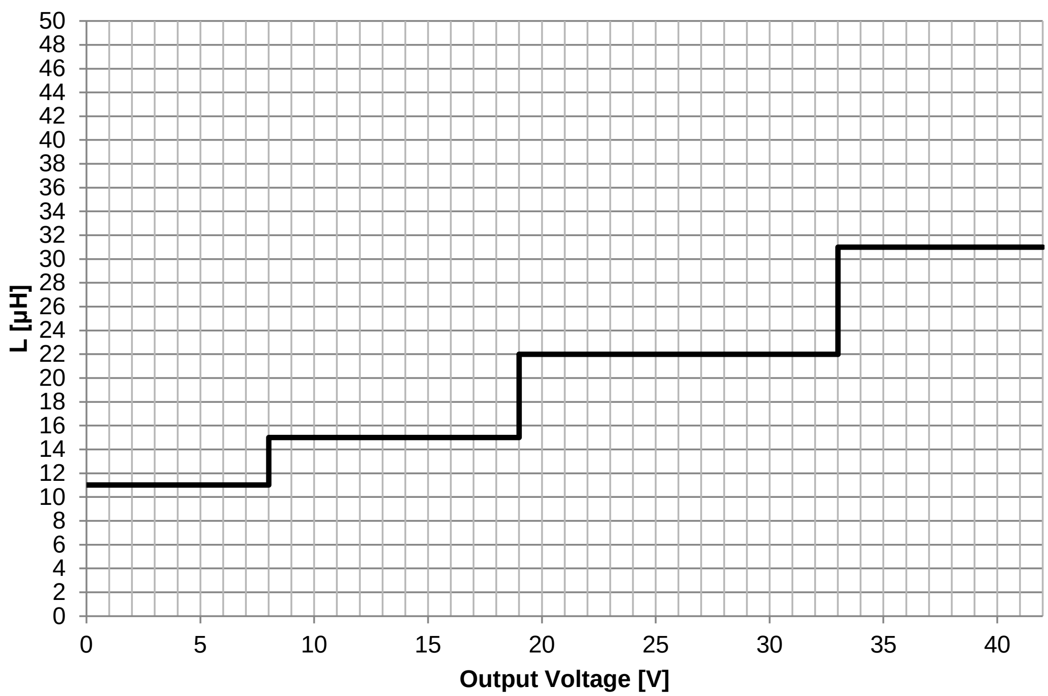

Figure 3. Output Voltage vs inductance(min)

When current that exceeds the rating of inductor flows into the inductor, the inductor causes a magnetic saturation which in turn causes a decline in efficiency and output oscillation. Please choose an inductor with a sufficient margin so that peak current does not exceed rating current of the inductor.

Input Capacitor

This IC needs an input decoupling capacitor. It is recommended a low ESR ceramic capacitor over 2.2µF.

The capacitance is selected considering temperature characteristics and bias voltage effect.

The input ripple voltage is determined by input capacitance CIN (C1 and C2 in p.2 Figure 1). Because the IC input voltage is decreased, consider input voltage range including ripple voltage. The input ripple voltage is estimated by the following.

$$\Delta Vin = \frac{IOUT_{(\max)} \times VOUT}{CIN \times f \times VIN} + (IOUT_{(\max)} \times RESR_{(\max)}) \ [\mathrm{V_{p\text{-}p}}]$$

RESR is ESR of input capacitor

Note that frequency decreases by 1/8 times in MaxDuty mode when the differential voltage between input and output is small. Refer to Detailed Description in the datasheet for the condition of MaxDuty mode.

Select a capacitor that has sufficient capacitance value to meet the recommended operating range with its input ripple voltage.

Please confirm the characteristic of RMS ripple current – temperature.

RMS ripple current (I_{RMS}) is following.

$$I_{RMS} \approx IOUT \times \sqrt{\frac{VOUT}{VIN} \times \left(1 - \frac{VOUT}{VIN}\right)} \ [\mathrm{A_{RMS}}]$$

I_{RMS} has a maximum value when VIN = 2 x VOUT

$$I_{RMS} \approx \frac{IOUT}{2} \ [\mathrm{A_{RMS}}]$$

Choose an input capacitor that has enough temperature margin at the I_{RMS}.

Output Capacitor

In order to reduce output ripple, a ceramic capacitor of low ESR is recommended. Also, for capacitor rating, take into consideration the DC bias characteristics. Use a capacitor with maximum rating of sufficient margin with respect to the output voltage.
Output ripple voltage Vpp is obtained through the following formula. While COUT is C6+C7+C8+C9+C10 in p.2 Figure 1.

$$Vpp = \Delta IL \times \left[\frac{1}{2\pi \times f \times COUT} + R_{\mathrm{ESR}}\right] \ [\mathrm{V}]$$

RESR is ESR of output capacitor

Please set the value within allowable ripple voltage.

Confirm rush current (I_{rush}) of the startup because the output capacitance has an effect of I_{rush}.
I_{rush} is estimated in the following.

$$I\mathrm{rush} = \frac{COUT \times VOUT \times f_{\mathrm{osc\_ex}}}{T_{\mathrm{softstart}} \times f_{\mathrm{osc}}} + \Delta IL + IOUT_{\mathrm{start}} \ [\mathrm{A}]$$

Where:
$T_{softstart}$ is soft start time;
f_{osc} is inner frequency, 300 kHz;
f_{osc_ex} is SYNC frequency (If the SYNC function is not used, f_{osc_ex} equals to f_{osc});
$IOUT_{start}$ is output current when IC is start up.

At least, It is required that I_{rush} is less than 2A that is minimum value of OCP threshold.

Output Voltage Setting

The reference voltage of internal ERROR AMP is 0.8V. Output voltage is determined by the equation below.

$$VOUT = \frac{R_5 + R_6}{R_6} \times 0.8 \ [\mathrm{V}]$$

Operating Duty Don is calculated by the following equation with input and output voltage and load current.

$$D_{\mathrm{on}} = \frac{VOUT}{VCC - R_{onH} \times IOUT} \times 100 \ [\%]$$

Thus, the available minimum output voltage is restricted by minimum duty shown as the following.

$$D_{\mathrm{on\_min}} = (f_{\mathrm{osc}} \times T_{\mathrm{on\_min}}) \times 100 \ [\%]$$

Where:

D_{on_min} is minimum duty;

f_{osc} is operating frequency;

T_{on_min} is minimum on time, 200ns.

And the available maximum output voltage is restricted by maximum duty shown as the following.

$$D_{\mathrm{on\_max}} = [1 - (f_{\mathrm{osc}} \times T_{\mathrm{off\_f}})] \times 100 \ [\%]$$

Where:

D_{on_max} is maximum duty;

f_{osc} is operating frequency ;

T_{off_f} is forced-off time, 300ns.

Bill of Materials

1. VOUT=5V, Io=1.5A, (VIN=10V to 42V), fosc=300kHz

Table 2. Bill of Materials 1

Quantity	Reference Designator	Part Number	Manufacturer	Value	Description [Unit: inch(mm)]
IC					
1	U1	BD9G201EFJ-M	Rohm	-	Buck DC/DC
Capacitor					
1	C1	GCM32EC71H106KA03	Murata	10µF	Ceramic Capacitor, 50V, X7S, ±10%, 1210(3225)
1	C2	GCM155R71H104KE02	Murata	0.1µF	Ceramic Capacitor, 50V, X7R, ±10%, 0402(1005)
1	C3	GCM155R71H102KA37	Murata	1000pF	Ceramic Capacitor, 50V, X7R, ±10%, 0402(1005)
1	C4	GCM155R71E104KE02	Murata	0.1µF	Ceramic Capacitor, 50V, X7R, ±10%, 0402(1005)
1	C5	GCM1555C1H180JA16	Murata	18pF	Ceramic Capacitor, 50V, X7R, ±5%, 0402(1005)
1	C6	GCM32EC71A476KE02	Murata	47µF	Ceramic Capacitor, 10V, X7S, ±10%, 1210(3225)
1	C7	GCM32EC71A476KE02	Murata	47µF	Ceramic Capacitor, 10V, X7S, ±10%, 1210(3225)
1	C8	-	-	-	Open
1	C9	-	-	-	Open
1	C10	-	-	-	Open
Resistor					
1	R1	MCR03EZPD1103	Rohm	110kΩ	Resistor, 50V, 0.1W, ±0.5%, 0603(1608)
1	R2	MCR03EZPD4302	Rohm	43kΩ	Resistor, 50V, 0.1W, ±0.5%, 0603(1608)
1	R3	MCR03EZPFX1502	Rohm	15kΩ	Resistor, 50V, 0.1W, ±1%, 0603(1608)
1	R4	-	-	-	Open
1	R5	MCR03EZPD4303	Rohm	430kΩ	Resistor, 50V, 0.1W, ±0.5%, 0603(1608)
1	R6	MCR03EZPD8202	Rohm	82kΩ	Resistor, 50V, 0.1W, ±0.5%, 0603(1608)
Diode					
1	D1	RBR5LAM60ATF	Rohm	-	Diode, 60V, 5A, 1910(4725)
Inductor					
1	L1	CLF10060NIT-220M-D	TDK	22µH	Inductor, 3.3A max, 51.6mΩ(max), ±20%, 4949(10.0 x 10.1)
		XAL5050-223M	Coilcraft	22µH	Inductor, 2.5A max, 99.7mΩ(max), ±20%, 2122(5.3 x 5.5)

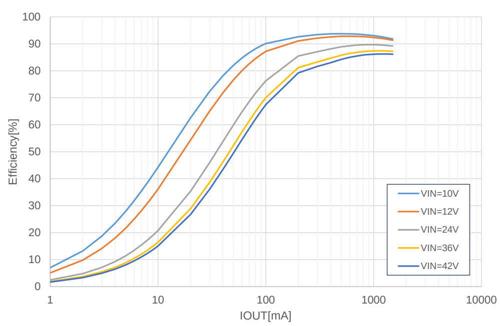

Figure 4. Efficiency vs Load Current
(BOM1, VOUT=5V, CLF10060NIT)

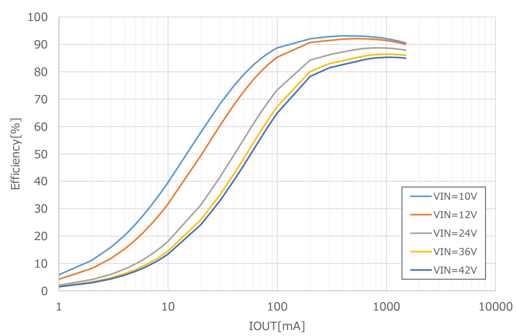

Figure 5. Efficiency vs Load Current
(BOM1, VOUT=5V, XAL5050)

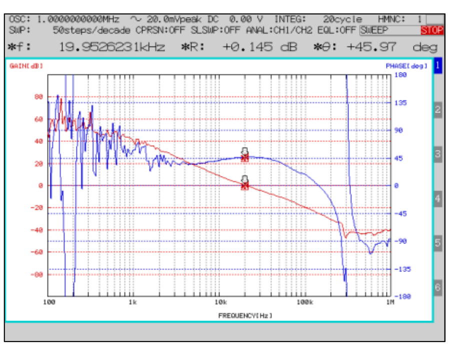

Figure 6. Frequency characteristics
(BOM1, VIN=12V, IOUT=1.5A)

Bill of Materials(continued)

2. VOUT=8V, Io=1.5A, (VIN=12V to 42V), fosc=300kHz

Table 3. Bill of Materials 2

Quantity	Reference Designator	Part Number	Manufacturer	Value	Description [Unit: inch(mm)]
IC					
1	U1	BD9G201EFJ-M	Rohm	-	Buck DC/DC
Capacitor					
1	C1	GCM32EC71H106KA03	Murata	10µF	Ceramic Capacitor, 50V, X7S, ±10%, 1210(3225)
1	C2	GCM155R71H104KE02	Murata	0.1µF	Ceramic Capacitor, 50V, X7R, ±10%, 0402(1005)
1	C3	GCM155R71H102KA37	Murata	1000pF	Ceramic Capacitor, 50V, X7R, ±10%, 0402(1005)
1	C4	GCM155R71E104KE02	Murata	0.1µF	Ceramic Capacitor, 50V, X7R, ±10%, 0402(1005)
1	C5	GCM1555C1H470JA16	Murata	47pF	Ceramic Capacitor, 50V, X7R, ±5%, 0402(1005)
1	C6	KCM55WR71E476MH01	Murata	47µF	Ceramic Capacitor, 25V, X7R, ±20%, 2421(6153)
1	C7	KCM55WR71E476MH01	Murata	47µF	Ceramic Capacitor, 25V, X7R, ±20%, 2421(6153)
1	C8	-	-	-	Open
1	C9	-	-	-	Open
1	C10	-	-	-	Open
Resistor					
1	R1	MCR03EZPD1103	Rohm	110kΩ	Resistor, 50V, 0.1W, ±0.5%, 0603(1608)
1	R2	MCR03EZPD4302	Rohm	43kΩ	Resistor, 50V, 0.1W, ±0.5%, 0603(1608)
1	R3	MCR03EZPFX1602	Rohm	16kΩ	Resistor, 50V, 0.1W, ±1%, 0603(1608)
1	R4	-	-	-	Open
1	R5	MCR03EZPD5603	Rohm	560kΩ	Resistor, 50V, 0.1W, ±0.5%, 0603(1608)
1	R6	MCR03EZPD6202	Rohm	62kΩ	Resistor, 50V, 0.1W, ±0.5%, 0603(1608)
Diode					
1	D1	RBR5LAM60ATF	Rohm	-	Diode, 60V, 5A, 1910(4725)
Inductor					
1	L1	CLF10060NIT-220M-D	TDK	22µH	Inductor, 3.3A max, 51.6mΩ(max), ±20%, 4949(10.0 x 10.1)
		XAL5050-223M	Coilcraft	22µH	Inductor, 2.5A max, 99.7mΩ(max), ±20%, 2122(5.3 x 5.5)

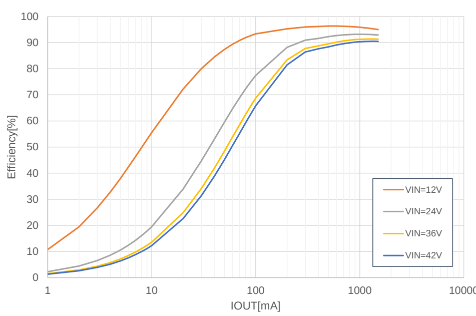

Figure 7. Efficiency vs Load Current (BOM2, VOUT=8V, CLF10060NIT)

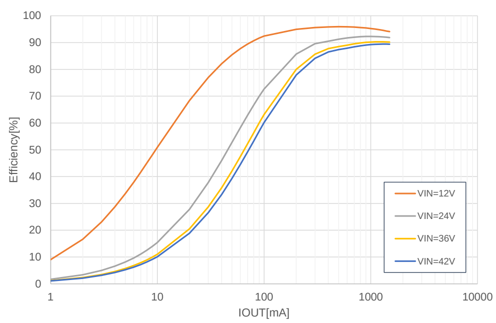

Figure 8. Efficiency vs Load Current (BOM2, VOUT=8V, XAL5050)

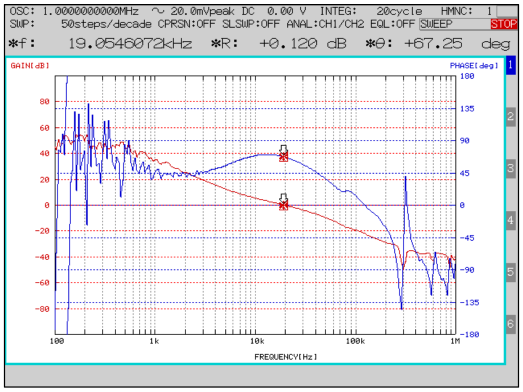

Figure 9. Frequency Characteristics (BOM2, VIN=12V, IOUT=1.5A)

Bill of Materials(continued)

3. VOUT=12V, Io=1.5A, (VIN=16V to 42V), fosc=300kHz

Table 4. Bill of Materials 3

Quantity	Reference Designator	Part Number	Manufacturer	Value	Description [Unit: inch(mm)]
IC					
1	U1	BD9G201EFJ-M	Rohm	-	Buck DC/DC
Capacitor					
1	C1	GCM32EC71H106KA03	Murata	10µF	Ceramic Capacitor, 50V, X7S, ±10%, 1210(3225)
1	C2	GCM155R71H104KE02	Murata	0.1µF	Ceramic Capacitor, 50V, X7R, ±10%, 0402(1005)
1	C3	GCM155R71H102KA37	Murata	1000pF	Ceramic Capacitor, 50V, X7R, ±10%, 0402(1005)
1	C4	GCM155R71E104KE02	Murata	0.1µF	Ceramic Capacitor, 50V, X7R, ±10%, 0402(1005)
1	C5	GCM1555C1H330JA16	Murata	33pF	Ceramic Capacitor, 50V, X7R, ±5%, 0402(1005)
1	C6	KCM55WR71E476MH01	Murata	47µF	Ceramic Capacitor, 25V, X7R, ±20%, 2421(6153)
1	C7	KCM55WR71E476MH01	Murata	47µF	Ceramic Capacitor, 25V, X7R, ±20%, 2421(6153)
1	C8	-	-	-	Open
1	C9	-	-	-	Open
1	C10	-	-	-	Open
Resistor					
1	R1	MCR03EZPD1103	Rohm	110kΩ	Resistor, 50V, 0.1W, ±0.5%, 0603(1608)
1	R2	MCR03EZPD4302	Rohm	43kΩ	Resistor, 50V, 0.1W, ±0.5%, 0603(1608)
1	R3	MCR03EZPFX2402	Rohm	24kΩ	Resistor, 50V, 0.1W, ±1%, 0603(1608)
1	R4	-	-	-	Open
1	R5	MCR03EZPD5103	Rohm	510kΩ	Resistor, 50V, 0.1W, ±0.5%, 0603(1608)
1	R6	MCR03EZPD3602	Rohm	36kΩ	Resistor, 50V, 0.1W, ±0.5%, 0603(1608)
Diode					
1	D1	RBR5LAM60ATF	Rohm	-	Diode, 60V, 5A, 1910(4725)
Inductor					
1	L1	CLF10060NIT-220M-D	TDK	22µH	Inductor, 3.3A max, 51.6mΩ(max), ±20%, 4949(10.0 x 10.1)
		XAL5050-223M	Coilcraft	22µH	Inductor, 2.5A max, 99.7mΩ(max), ±20%, 2122(5.3 x 5.5)

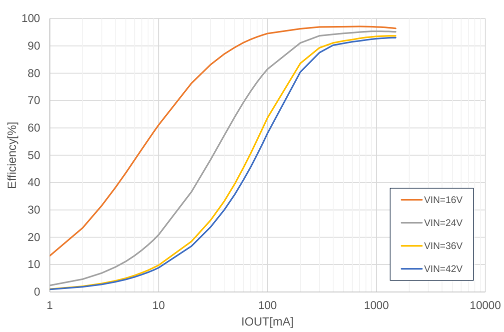

Figure 10. Efficiency vs Load Current (BOM3, VOUT=12V, CLF10060NIT)

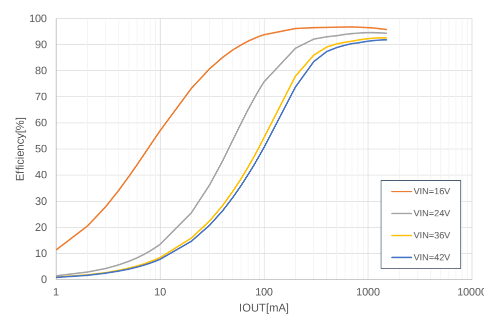

Figure 11. Efficiency vs Load Current (BOM 3, VOUT=12V, XAL5050)

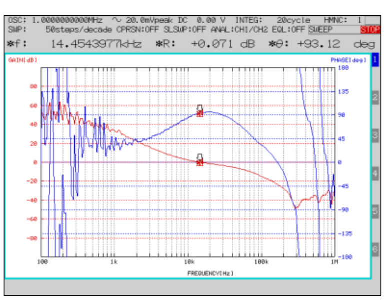

Figure 12. Frequency characteristics (BOM3, VIN=24V, IOUT=1.5A)

Bill of Materials(continued)

4. VOUT=24V, Io=1.5A, (VIN=32V to 42V), fosc=300kHz

Table 5. Bill of Materials 4

Quantity	Reference Designator	Part Number	Manufacturer	Value	Description [Unit: inch(mm)]
IC					
1	U1	BD9G201EFJ-M	Rohm	-	Buck DC/DC
Capacitor					
1	C1	GCM32EC71H106KA03	Murata	10µF	Ceramic Capacitor, 50V, X7S, ±10%, 1210(3225)
1	C2	GCM155R71H104KE02	Murata	0.1µF	Ceramic Capacitor, 50V, X7R, ±10%, 0402(1005)
1	C3	GCM155R71H102KA37	Murata	1000pF	Ceramic Capacitor, 50V, X7R, ±10%, 0402(1005)
1	C4	GCM155R71E104KE02	Murata	0.1µF	Ceramic Capacitor, 50V, X7R, ±10%, 0402(1005)
1	C5	GCM1555C1H680JA16	Murata	68pF	Ceramic Capacitor, 50V, X7R, ±5%, 0402(1005)
1	C6	KCM55WR7YA476MH01	Murata	47µF	Ceramic Capacitor, 35V, X7R, ±20%, 2421(6153)
1	C7	KCM55WR7YA476MH01	Murata	47µF	Ceramic Capacitor, 35V, X7R, ±20%, 2421(6153)
1	C8	-	-	-	Open
1	C9	-	-	-	Open
1	C10	-	-	-	Open
Resistor					
1	R1	MCR03EZPD1103	Rohm	110kΩ	Resistor, 50V, 0.1W, ±0.5%, 0603(1608)
1	R2	MCR03EZPD4302	Rohm	43kΩ	Resistor, 50V, 0.1W, ±0.5%, 0603(1608)
1	R3	MCR03EZPFX2402	Rohm	24kΩ	Resistor, 50V, 0.1W, ±1%, 0603(1608)
1	R4	-	-	-	Open
1	R5	MCR03EZPD4703	Rohm	470kΩ	Resistor, 50V, 0.1W, ±0.5%, 0603(1608)
1	R6	MCR03EZPD1602	Rohm	16kΩ	Resistor, 50V, 0.1W, ±0.5%, 0603(1608)
Diode					
1	D1	RBR5LAM60ATF	Rohm	-	Diode, 60V, 5A, 1910(4725)
Inductor					
1	L1	CLF10060NIT-220M-D	TDK	22µH	Inductor, 3.3A max, 51.6mΩ(max), ±20%, 4949(10.0 x 10.1)
		XAL5050-223M	Coilcraft	22µH	Inductor, 2.5A max, 99.7mΩ(max), ±20%, 2122(5.3 x 5.5)

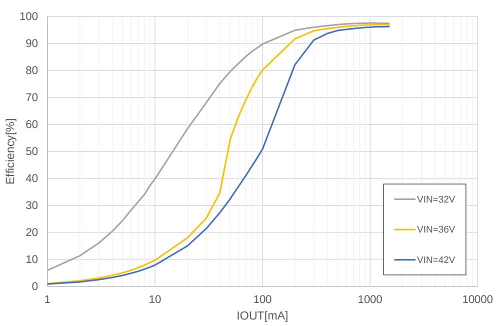

Figure 13. Efficiency vs Load Current (BOM4, VOUT=24V, CLF10060NIT)

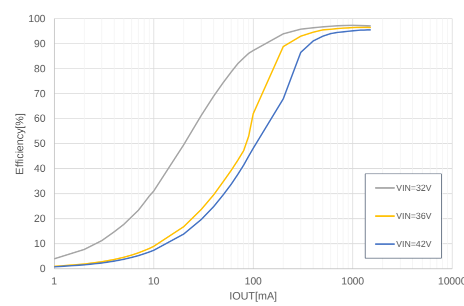

Figure 14. Efficiency vs Load Current (BOM4, VOUT=24V, XAL5050)

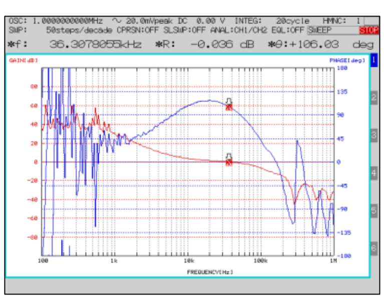

Figure 15. Frequency characteristics (BOM4, VIN=36V, IOUT=1.5A)

Bill of Materials(continued)

5. VOUT=24V, Io=1.5A, (VIN=32V to 42V), fosc=300kHz

Table 6. Bill of Materials 5

Quantity	Reference Designator	Part Number	Manufacturer	Value	Description [Unit: inch(mm)]
IC					
1	U1	BD9G201EFJ-M	Rohm	-	Buck DC/DC
Capacitor					
1	C1	GCM32EC71H106KA03	Murata	10µF	Ceramic Capacitor, 50V, X7S, ±10%, 1210(3225)
1	C2	GCM155R71H104KE02	Murata	0.1µF	Ceramic Capacitor, 50V, X7R, ±10%, 0402(1005)
1	C3	GCM155R71H102KA37	Murata	1000pF	Ceramic Capacitor, 50V, X7R, ±10%, 0402(1005)
1	C4	GCM155R71E104KE02	Murata	0.1µF	Ceramic Capacitor, 50V, X7R, ±10%, 0402(1005)
1	C5	GCM1555C1H820JA16	Murata	82pF	Ceramic Capacitor, 50V, X7R, ±5%, 0402(1005)
1	C6	KCM55QE7YA226KH01	Murata	22µF	Ceramic Capacitor, 35V, X7R, ±20%, 2421(6153)
1	C7	KCM55QE7YA226KH01	Murata	22µF	Ceramic Capacitor, 35V, X7R, ±20%, 2421(6153)
1	C8	KCM55QE7YA226KH01	Murata	22µF	Ceramic Capacitor, 35V, X7R, ±20%, 2421(6153)
1	C9	KCM55QE7YA226KH01	Murata	22µF	Ceramic Capacitor, 35V, X7R, ±20%, 2421(6153)
1	C10	KCM55QE7YA226KH01	Murata	22µF	Ceramic Capacitor, 35V, X7R, ±20%, 2421(6153)
Resistor					
1	R1	MCR03EZPD1103	Rohm	110kΩ	Resistor, 50V, 0.1W, ±0.5%, 0603(1608)
1	R2	MCR03EZPD4302	Rohm	43kΩ	Resistor, 50V, 0.1W, ±0.5%, 0603(1608)
1	R3	MCR03EZPFX2402	Rohm	24kΩ	Resistor, 50V, 0.1W, ±1%, 0603(1608)
1	R4	-	-	-	Open
1	R5	MCR03EZPD4703	Rohm	470kΩ	Resistor, 50V, 0.1W, ±0.5%, 0603(1608)
1	R6	MCR03EZPD1602	Rohm	16kΩ	Resistor, 50V, 0.1W, ±0.5%, 0603(1608)
Diode					
1	D1	RBR5LAM60ATF	Rohm	-	Diode, 60V, 5A, 1910(4725)
Inductor					
1	L1	CLF10060NIT-220M-D	TDK	22µH	Inductor, 3.3A max, 51.6mΩ(max), ±20%, 4949(10.0 x 10.1)
		XAL5050-223M	Coilcraft	22µH	Inductor, 2.5A max, 99.7mΩ(max), ±20%, 2122(5.3 x 5.5)

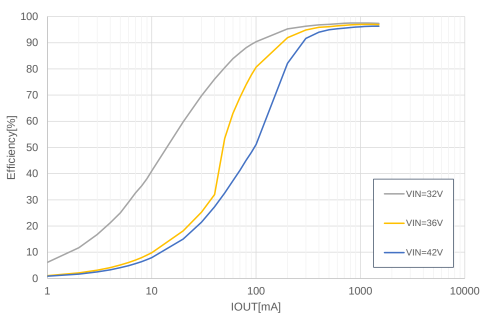

Figure 16. Efficiency vs Load Current

(BOM5, VOUT=24V, CLF10060NIT)

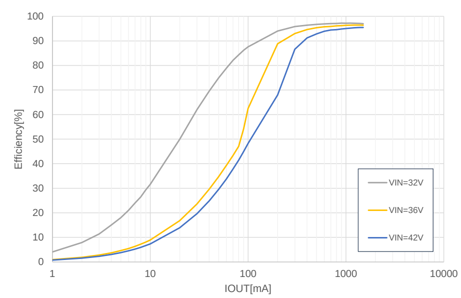

Figure 17. Efficiency vs Load Current

(BOM5, VOUT=24V, XAL5050)

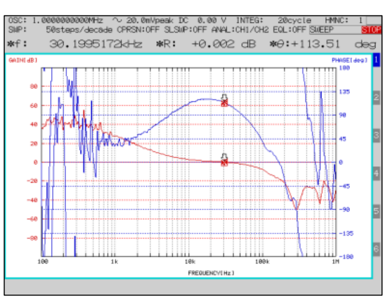

Figure 18. Frequency characteristic

(BOM5, VIN=36V, IOUT=1.5A)

Bill of Materials(continued)

6. VOUT=24V, Io=1.5A, (VIN=32V to 42V), fosc=300kHz

Table 7. Bill of Materials 6

Quantity	Reference Designator	Part Number	Manufacturer	Value	Description [Unit: inch(mm)]
IC					
1	U1	BD9G201EFJ-M	Rohm	-	Buck DC/DC
Capacitor					
1	C1	GCM32EC71H106KA03	Murata	10µF	Ceramic Capacitor, 50V, X7S, ±10%, 1210(3225)
1	C2	GCM155R71H104KE02	Murata	0.1µF	Ceramic Capacitor, 50V, X7R, ±10%, 0402(1005)
1	C3	GCM155R71H102KA37	Murata	1000pF	Ceramic Capacitor, 50V, X7R, ±10%, 0402(1005)
1	C4	GCM155R71E104KE02	Murata	0.1µF	Ceramic Capacitor, 50V, X7R, ±10%, 0402(1005)
1	C5	GCM1555C1H121JA16	Murata	120pF	Ceramic Capacitor, 50V, X7R, ±5%, 0402(1005)
1	C6	PCV1V101MCL1GS	Nichicon	100µF	Aluminum Electrolytic Capacitor, 35V, ±20%, ±20%, 4141(10.3 x 10.3)
1	C7	-	-	-	-
1	C8	-	-	-	-
1	C9	-	-	-	-
1	C10	-	-	-	-
Resistor					
1	R1	MCR03EZPD1103	Rohm	110kΩ	Resistor, 50V, 0.1W, ±0.5%, 0603(1608)
1	R2	MCR03EZPD4302	Rohm	43kΩ	Resistor, 50V, 0.1W, ±0.5%, 0603(1608)
1	R3	MCR03EZPFX2402	Rohm	24kΩ	Resistor, 50V, 0.1W, ±1%, 0603(1608)
1	R4	-	-	-	Open
1	R5	MCR03EZPD4703	Rohm	470kΩ	Resistor, 50V, 0.1W, ±0.5%, 0603(1608)
1	R6	MCR03EZPD1602	Rohm	16kΩ	Resistor, 50V, 0.1W, ±0.5%, 0603(1608)
Diode					
1	D1	RBR5LAM60ATF	Rohm	-	Diode, 60V, 5A, 1910(4725)
Inductor					
1	L1	CLF10060NIT-220M-D	TDK	22µH	Inductor, 3.3A max, 51.6mΩ(max), ±20%, 4949(10.0 x 10.1)
		XAL5050-223M	Coilcraft	22µH	Inductor, 2.5A max, 99.7mΩ(max), ±20%, 2122(5.3 x 5.5)

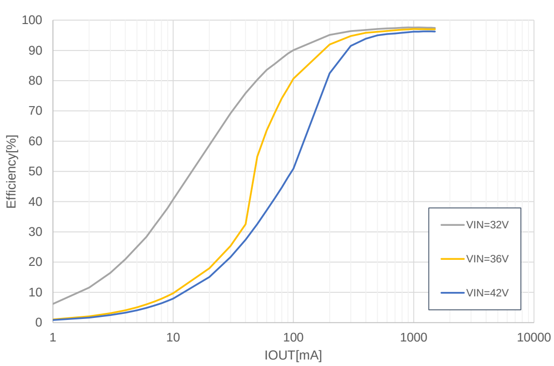

Figure 19. Efficiency vs Load Current
(BOM6, VOUT=24V, CLF10060NIT)

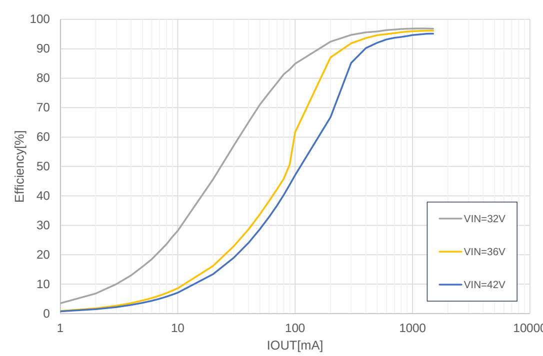

Figure 20. Efficiency vs Load Current
(BOM6, VOUT=24V, XAL5050)

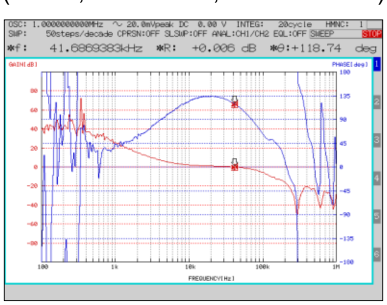

Figure 21. Frequency characteristics
(BOM6, VIN=36V, IOUT=1.5A)

The product names and manufacturers listed in the bill of materials are the latest ones confirmed at the time of creating this application note. In some cases, it may happen that some parts are no longer available in the future. Customers are advised to select an equivalent product based on the characteristics listed in the table by yourself. Regarding ceramic capacitors, considering the DC bias characteristics and select the one with the actual capacitance equivalent.

For reference, figure 22 shows the DC bias characteristics of GCM32EC71A476KE02(Murata) listed in the BOM1 C6 and C7. Actual capacitance degrades to 31.6μF from the nominal value of 47μF under the condition of 5V output(DC bias voltage is 5V.) When selecting an alternative component, select the product that has same capacitance under 5V of DC bias voltage. (Please check with the capacitor manufacturer for the DC bias characteristics of ceramic capacitors.)

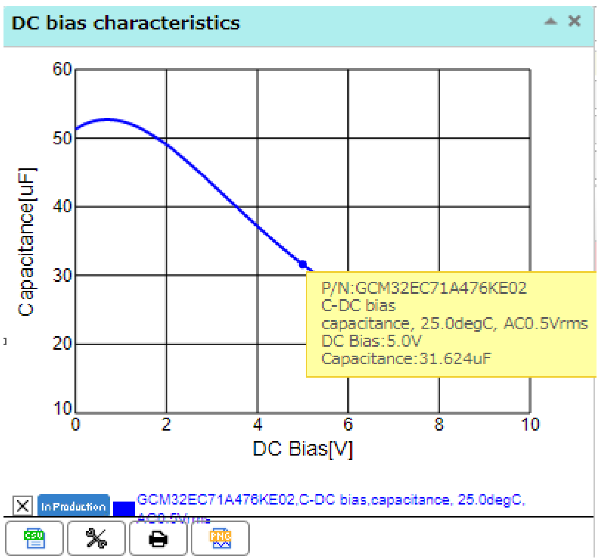

Figure 22. DC bias characteristics of GCM32EC71A476KE02(Murata)

Revision History

Date	Revision Number	Description
26.May. 2021	001	Initial release

Notes

1) The information contained herein is subject to change without notice.

2) Before you use our Products, please contact our sales representative and verify the latest specifications :

3) Although ROHM is continuously working to improve product reliability and quality, semiconductors can break down and malfunction due to various factors.
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4) Examples of application circuits, circuit constants and any other information contained herein are provided only to illustrate the standard usage and operations of the Products. The peripheral conditions must be taken into account when designing circuits for mass production.

5) The technical information specified herein is intended only to show the typical functions of and examples of application circuits for the Products. ROHM does not grant you, explicitly or implicitly, any license to use or exercise intellectual property or other rights held by ROHM or any other parties. ROHM shall have no responsibility whatsoever for any dispute arising out of the use of such technical information.

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7) For use of our Products in applications requiring a high degree of reliability (as exemplified below), please contact and consult with a ROHM representative : transportation equipment (i.e. cars, ships, trains), primary communication equipment, traffic lights, fire/crime prevention, safety equipment, medical systems, servers, solar cells, and power transmission systems.

8) Do not use our Products in applications requiring extremely high reliability, such as aerospace equipment, nuclear power control systems, and submarine repeaters.

9) ROHM shall have no responsibility for any damages or injury arising from non-compliance with the recommended usage conditions and specifications contained herein.

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